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A BACTERIOLOGICAL STUDY OF URETHRITIS FOLLOWING PENICILLIN THERAPY OF GONORRHEA

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The continuation of a urethritis following penicillin therapy for gonorrhea has led to the belief by some workers that a penicillin-resistant gonococcus is responsible. This is especially true where cultural facilities for isolating and identifying the gonococcus are not available. Since repeated culturing of discharges from patients treated for gonorrhea with penicillin at the U. S. Marine Hospital, Staten Island, failed to show the presence of the gonococcus, a bacteriologic study of the microbial flora was undertaken in the hope of finding a common etiologic agent.

The patients used in this study constituted about one-tenth of those under treatment at the time. Generally there was evidence of only a mild or moderate urethritis, the patient observing a "morning drop or tear" or being able to express the discharge at any time during the day. A severe discharge was seldom seen.

Patients for the study were selected according to these criteria: Following penicillin therapy for gonorrhea, they had no demonstrable gonococci from urethral and urinary specimens by cultural and microscopic methods; they had a persistent urethral discharge either in the morning or during the course of the day (this discharge being nonexistent prior to gonococcal infection); and they had a positive cystoscopic examination for evidence of urethritis.

Methods

The medium for the identification of Neisseria gonorrhea employed was the VD medium, described by Thayer, Schubert and Bucca,[1] to which 0.24 mg. per cent Nile blue A was added for its bacteriostatic effect on non-*Neisseria* genera. The final pH of the medium was 7.2-7.4.

The urethral meatus of all patients was cleaned with sterile gauze pads moistened in sterile saline. The specimen was then obtained by means of a cotton-tipped applicator and either streaked directly over the agar surface of the Petri dish in a pattern to obtain discrete colonies, or was placed in a carrying tube containing Proteose-Peptone No. 3-sodium chloride solution and soon after arrival of specimen in laboratory, was seeded onto plates.[2] The inoculated plates were placed in a moist air-tight container and incubated at 35°-36° C. for a period of 48 hours under 10 per cent carbon dioxide tension at atmospheric pressure. The colonial characteristics, microscopic appearance, tinctorial reaction (with Hucker's modification of Gram's stain), oxidase test and sugar confirmation constituted the method followed for demonstrating the presence or absence of the gonococcus in culture. Whenever it became necessary to test urine specimens, 10 ml. of morning urine was centrifuged at high speed, the supernatant fluid discarded, and the sediment suspended in the remaining minute quantity of supernatant. This suspension was treated in the same manner as that described for culturing urethral discharge specimens. Prostatic secretions were collected directly into a wide mouth test tube containing the peptone-sodium chloride solution and were plated with a sterile swab and a platinum loop.

For the study of the microbial flora of the specimens, each specimen was inoculated on two plates containing modified McLeod phosphate infusion agar base enriched with five per cent defibrinated rabbit blood.[3] Both plates were incubated at 35°-36° C. for a period of 18 hours, one aerobically and the other in a Brewer anaerobic jar. The incubated cultures were subjected to the following studies: (a) enumeration and scoring of the degrees of growth, (b) identification of the different types of colonies, at least as to genera, and (c) recording of the predominating type of colonies in each plate.

The usual differential media and biochemical tests were used for the identification of the coliform organisms. Staphylococcal colonies were picked off and streaked on Chapman's staphylococcus medium No. 110, and then were incubated for a period of 48 hours at 30° C. The colonies were examined microscopically and for type of chromogenesis. In addition, coagulase tests were performed using pretested citrated rabbit blood, according to the method of Chapman.[4] Streptococcal colonies were re-streaked on Casman's[5] agar and the type or absence of hemolysis noted.

Penicillin-susceptibility tests were made by serial dilution covering a range from 0.015 u/ml. to 32 u/ml. of heart infusion broth. Streptomycin-susceptibility tests were carried out in a beef extract-Armour peptone agar medium containing rabbit

serum. A series of streptomycin concentrations varying from 0.125 microgram to 128 micrograms per ml. of medium were prepared separately and poured into Petri dishes. Each series of streptomycin plates was divided into a number of sectors suitable for streaking several different suspensions of organisms. The end point for both the penicillin and the streptomycin susceptibility tests was the lowest concentration of the antibiotic showing complete inhibition of growth after a 24-hour incubation period.

For the growth and identification of pleuropneumonia-like organisms the VD medium, without dye, at pH 7.8 was utilized. In later work, 0.0128 per cent thallium acetate and 60 units of penicillin per ml. were introduced into the medium to limit the growth of contaminating organisms, according to the method of Edward.[6] The specimen was streaked in the same manner as described above and incubated for a period of 7 to 10 days at 35°-36° C. in 10 per cent carbon dioxide. At first the plates were prepared according to the method observed in Doctor Dienes' laboratory. The adjusted VD medium in a Petri dish was inoculated with the specimen. A moderately sized slab of sterile blood agar was aseptically placed so that it adhered to the underside of the Petri dish cover; the blood agar was then heavily inoculated with a strain of *Serratia marcescens*. The bottom part of the dish was covered with this top part in the usual fashion and melted paraffin was poured into the space between the walls of the two sections of the dish. These plates were incubated for 7-10 days at 35°-36° C. However, most of the tests for demonstrating the presence or absence of pleuropneumonia-like organisms were performed by incubating the plates containing the adjusted VD medium (without the prepared covers and the paraffin seal) directly in an atmosphere of 10 per cent carbon dioxide for the aforementioned period of time and temperature.

The incubated plates were examined with the aid of a hand lens or low power light microscope. Typical colonies pictured and described by Sabin,[7] Salaman,[8] and Dienes[9] were confirmed by making agar impression preparations of selected colonies, in the following manner. A small piece or plug of the agar bearing the growth of colonies suspected to be pleuropneumonia-like, was removed and pared to a thickness suitable for microscopic studies. The piece was then placed face up on a clean glass slide. A chemically clean cover slip was coated on one side with a thin homogeneous film of one per cent sodium carbonate and, when dried, was re-coated with a mixture of one per cent methylene blue and one-half per cent azure II in absolute alcohol. A bacteriological loop was used for this process. When the second coat dried, the coverslip, coated side down, was carefully placed

on the surface of the agar mount, particular precautions being taken to preserve the colonial organization of the preparation. The mount was finally stabilized by ringing the area with melted paraffin. It was examined first with low power and, finally, oil immersion microscopy for typical pleuropneumonia-like organisms.

A wet preparation of the specimen was made and examined immediately upon receipt in the laboratory or kept in a warmed environment, for the purpose of demonstrating protozoa, particularly trichomonads, the presence of which excluded the patient from the study.

A Gram-stained film preparation completed the battery of tests for each specimen.

Results

The incidence of bacteria encountered in cultures of urethral exudates is shown in TABLE I. Since anaerobic cultures were not performed for all patients, the figures given are those for the aerobic cultures. These figures are based on the primary cultures taken—subsequent cultures are not included. It is noted that of the 96 patients examined, staphylococci and diptheroids were encountered most frequently. *Staphylococcus aureus* was observed more frequently than *Staphylococcus albus*. When the cultures were examined for predominating organisms, it was also found that the order of predominance was the same as that of incidence.

TABLE I

Aerobic Organisms Isolated in 96 Patients

Organisms	Number of Times Isolated
Staphylococcus, aureus	60
Staphylococcus, albus	47
Streptococcus, alpha variety	5
Streptococcus, beta variety	2
Streptococcus, gamma variety	1
Diphtheroids	63
Gaffkya tetragena	4
Paracolon group	1
Proteus spp.	1
Aerobacter spp.	2
Mima spp.	1
Escherichia coli	1
Sarcina spp.	5
No growth	5

In a smaller series of patients (52), as shown in TABLE II, cultures were examined both aerobically and anaerobically. It was found that there was no significant difference in incidence of organisms obtained by the different cultures. However, when predominant diphtheroids were considered, the per cent found anaerobically was twice that found aerobically. (Not shown in table.)

Coagulase tests performed on all staphylococcal cultures obtained from 96 patients studied, showed that in 79 cultures of

TABLE II

Aerobic and Anaerobic Organisms Isolated in 52 Patients

Organisms	Number of Times Isolated	
	Aerobes	Anaerobes
Staphylococcus aureus	43	35
Staphylococcus albus	3	3
Streptococcus, alpha variety	1	2
Streptococcus, beta variety	2	1
Streptococcus, gamma variety	0	3
Diphtheroids	33	40
Gaffkya tetragena	0	3
Paracolon group	1	1
Proteus spp.	1	1
Alcaligenes faecalis	0	2
Aerobacter spp.	1	1
No growth	5	2

Staphylococcus aureus, 7.6 per cent gave a positive reaction; of the 58 *Staphylococcus albus* cultures examined, none showed coagulase activity.

Since all of the patients had been previously treated with penicillin, it seemed of interest to determine the resistance of the cultured organisms to penicillin and streptomycin. For this experiment 17 cultures of *Staphylococcus aureus*, 54 of *Staphylococcus albus*, and 26 of diptheroids were were chosen for comparative work. The level of susceptibility to penicillin and streptomycin was arbitrarily chosen on the basis of blood levels developed to these antibiotics during the 24-hour period after injection. In the case of penicillin, 300,000 units of procaine penicillin in oil and aluminum monostearate gave, on the average, blood levels of 0.1 unit per ml. of serum at the end of 24 hours (Bucca et al[10]). Patients treated with 1.0 to 1.6 grams of streptomycin daily developed a peak of about 25 micrograms per ml. of serum. On this basis, as seen in TABLE III, it was shown that 9 of the 17 cultures of *Staphylococcus aureus* were susceptible to streptomycin alone, and 8 cultures were found to be sensitive to both penicillin and streptomycin. Of the 54 cultures of *Staphylococcus albus*, two were found sensitive to penicillin alone, 26 to streptomycin alone, and 26 were susceptible to both antibiotics. Of the 26

TABLE III

Susceptibility of Predominating Organisms to Penicillin and Streptomycin

Organisms	Total Cultures	Sensitive to Penicillin* Only	Sensitive to Streptomycin† Only	Sensitive to Both Penicillin and Streptomycin
Staphylococcus aureus	17	0	9	8
Staphylococcus albus	54	2	26	26
Diphtheroids	26	1	20	5

* Penicillin inhibition by 0.1 unit/ml. or less.
† Streptomycin inhibition by 25 micrograms/ml. or less.

cultures of diphtheroids examined, one was found to be sensitive to penicillin alone, 20 to streptomycin only, and 5 to both drugs.

None of the 42 patients examined for evidence of pleuropneumonia-like organisms was found positive. However, in one of the patients who had to be excluded from the study because of the presence of trichomonads, a positive culture of pleuropneumonia-like organisms was obtained. It is interesting to note that in 30 female patients examined during this period for pleuropneumonia-like organisms, 20 showed positive cultures. Twelve of these 20 patients also showed evidence of trichomonads.

Discussion

The results just presented have not indicated a single entity for the urethritis following penicillin therapy of gonorrhea. It is felt that the combination of predominant organisms in the flora might be irritative enough to continue the urethritis. As shown in TABLE III, practically all of the cultures resistant to penicillin were susceptible to streptomycin.

That the urethritis may be due to continued irritative action of the flora is borne out by work now in progress in which exudate from patients with non-gonococcal urethral discharge is plated out on suitable media containing varying concentrations of penicillin and of streptomycin. In this manner the susceptibility of the various microbial types in the specimen is determined by comparing the degree of inhibition of growth with the growth in the control plates containing no antibiotics. Subsequent treatment with streptomycin (if the cultures are not resistant) has invariably resulted in the cessation of symptoms within 24 to 48 hours.

Summary and Conclusion

The results of bacteriologic study of 96 patients with urethritis following penicillin therapy for gonorrhea are presented.

The predominant organisms encountered in the study were staphylococci and diphtheroids.

No single entity was found to be the cause of the urethritis.

Susceptibility of the predominating organisms found in the urethral flora to penicillin and streptomycin was discussed.

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DETERMINATION OF HEMOGLOBIN AND THE RED CELL COUNT ON THE SAME SAMPLE OF BLOOD WITH A PHOTOELECTRIC COLORIMETER

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The photoelectric colorimeter has become an accepted instrument in the clinical laboratory. Its use in hematological studies for the determination of hemoglobin seems to be the most accurate of current methods. Laboratory workers are now using it as a turbidimeter for determining the red blood cell count.

In 1939, in the Clinical Laboratory of the Medical Division, Wilmington, Del., we had routinely made the red cell count and hemoglobin determination on the same sample of blood, using an Evelyn photoelectric colorimeter. The technique was that of Dr. Allen Fleming. The results compared very favorably with the count as obtained with the hemacytometer and the hemoglobin values obtained with the Haden-Hausser instrument.

We would have liked to have used this method on the war construction jobs but several things made this impractical; the scarcity of photoelectric colorimeters, precision glassware, and the time to train technicians in colorimetric technique. So it was not until 1947, at the Chambers Works Medical Department, that we were again able to adopt this method.

From time to time since 1940 articles have appeared in the Medical Journals describing the experiences of laboratory workers along this line of thought. A very excellent paper by Dr. Leon Blum was published in 1945 in the American Journal of Clinical Pathology. He described a method almost identical with that used by us in 1939.

The volume of work in our laboratories led us to seek a method that would enable us to shorten the time devoted to red cell counts. Previous experience had shown that the photoelectric colorimeter could do this. This knowledge, plus the fact that the greater number of counts would be well within normal limits, led our Supervision to the conclusion that it would be worth a trial.

It was not an over-night idea or job. Weeks of preparation and checks went into it before we adopted it as a routine procedure. In fact we had been using this method one month before the physicians on our staff became aware of it. They noticed that the three week check count was identical in some instances and wondered if the technicians were simply copying figures. After one year and some odd 20,000 counts, we feel that it has surpassed our expectations.

Before discussing the technique we use I would like to digress for a short time and talk about blood. To understand fully the problems confronting the laboratory workers we need to understand what we try to do when we make a blood count. Too many people pin their faith on a difference of a few cells in a blood count, a single blood count!

First of all, we are dealing with one of the four main tissues of the body, blood. The other three are connective tissue proper, cartilage, and bone. In blood the intra-cellular substance is liquid. It circulates in a system of closed tubes, the blood vessels, and it has been estimated that in man, it comprises about 7% of the body weight.

In this liquid are suspended great numbers of microscopic structures, the red cells, the white cells, platelets, and blood dust. The liquid portion, or plasma, appears colorless when viewed in a thin film, but it may have a gray or yellowish color when seen in large quantities. As we are concerned mainly with the red corpuscles we shall confine ourselves to the properties which may influence the counting of these cells or their hemoglobin content.

In man these cells are biconcave, or convex-concave, disks. They are soft and flexible, and are distorted by the slightest mechanical influence. Normal cells will immediately resume their usual form when this influence is removed.

Viewed in profile these cells have elongated bodies with rounded ends and a constricted middle part. Under normal conditions their size remains uniform, about 7.5 microns in diameter. The color is a greenish yellow which is especially marked at the periphery where the colored substance is thickest. When seen in masses their color is a dense red. The pigment which gives this

color to the cells is hemoglobin, and it can readily be separated from the cell, dissolving into the plasma.

These red cells have a tendency to adhere to one another by their broad surfaces, forming long columns resembling piles of coins. This has been seen to occur in the blood circulating in the blood vessels Remembering the film and discussion of "Sludged Blood" by Dr. E. H. Bloch of the University of Chicago as presented at the annual Dupont Medical Meeting last year, one may weli wonder how these cells ever arrive anywhere.

They are not evenly distributed, at all times, in the body. During complete inactivity there is little or no variation, but after strenuous exercise there may be a transient increase in volume. Wintrobe suggests that this may be the result of a re-distribution of cells, and/or, a liberation of cells from such reservoirs as the spleen, as well as a loss of plasma. Body surface may have some influence on their number, and emotion such as fear is thought to increase them temporarily.

Outside the blood vessels blood coagulates rapidly. Even if an anticoagulant is added, tiny clots invisible to the eye may be present.

Many of the things we now know about blood were not known back in 1851 when Vierodts made the first actual count of cells. He used a thin smear of blood on a slide, keeping the cells free in a gummy diluting fluid, and counted them by means of a finely ruled micrometer disk. The counts were made on his own blood and from an average of nine counts he obtained the figure 5,140,000 cells per cubic millimeter. This was a very remarkable feat in that nearly one hundred years later we still accept as a normal count, 5,000,000 cells per cubic millimeter of blood!

Wintrobe, Haden, and others, have questioned this so-called normal value, and during recent years many studies have been made of the sources of error in counting blood. Magath and Hurn especially investigated the error in blood cell counts as made in good routine practice. It was found that if all precautions were taken to avoid the usual errors due to inaccurate dilution, too slow manipulation, incorrect filling of the counting chamber, inaccurate instruments, and hasty counting on the part of the laboratorian, the estimate of cells per cubic millimeter of blood is still subject to error.

Each corpuscle takes a place at random among the 400 ruled squares on the counting chamber. This is the Law of Distribution and the accepted limit of error for this is a plus or minus 9%. Then we have the error of the counting chamber due to variations in calibration, filling technique, and pressure of the cover slip, which is estimated at 4.6%. The error of the pipette

is 4.7% of the mean count. Since the accepted limit of significance is twice the standard deviation, the error in a single estimate of the red cell count by the hemacytometer method is 16%.

With such errors proved to exist under controlled conditions, and since the counting of red blood cells has become one of the most frequent of laboratory procedures and is laboriously time consuming, it followed that laboratory workers looked for a new method. In industrial medicine where the trend of counts on an individual subjected to a chemical exposure is more important than a single count, it was a challenge.

The principle involved was the measurement of light passing through a suspension of particles such as red blood cells. When light passes through a turbid solution it may be considered to be broken into the following components, (Drabkin):

1. A fraction of light which is absorbed, A, as is the case with a clear solution.
2. A fraction of light, T, which is transmitted through the suspension so nearly parallel as to be measured in the photometer.
3. A fraction of light, R, which is scattered backward or reflected by the particles in the suspension.

The measurement of this light transmitted in parallel forward direction may be used to determine the concentration of suspended matter. This is the basic principle of turbidimetry. The measurement and evaluation of these light fractions is a very complex subject and beyond the scope of the writer.

What we need to know, and remember, is as Dr. Blum stated, "that the enumeration of the red blood cells by means of a photoelectric apparatus will depend upon the number, size, and hemoglobin concentration (density), as well as upon the wavelength of the filter employed." Breaking that sentence down we have the following salient factors:

1. If cells are uniform in size and density (hemoglobin) then the absorption of light passing through the suspension will follow a uniform rule for calculating the number.
2. Variations in size, shape, or density, will influence the count obtained.

An examination of the stained slide would draw attention to these characteristics. We shall discuss our findings along this line later when we show comparison counts.

The question has arisen as to what part, if any, the leucocytes and plasma play in influencing the final count. We have used plasma as a blank with results that were insignificant. The dilution of cells we use, 1 to 500, would appear to take care of this. Many of our white counts range from 10,000 to 20,000 but we have not found the red cells increased in such cases. One case with a white cell count of over 200,000 and a low red cell count gave more consistent follow-up counts with the photoelectric colorimeter.

TECHNIC

1. Apparatus.

We use a Leitz photoelectric colorimeter. It had been in use in the laboratory for hemoglobins and chemistry, and was easy to operate.

We use the green filter for both the red cell count and the hemoglobin. It has a wavelength starting at 480, a peak at 525, and stopping at 565, (according to the manufacturer). With the Evelyn instrument we had used a red filter for the cell count and a green filter for the hemoglobin. When we calibrated the Leitz we found the green filter to give the widest spread on the scale of the galvanometer. This had the added advantage of not having to change filters, (could be a source of error).

2. Glassware

The sampling tubes are small 16 x 100 mm test tubes which are set up in Kolmer wire racks, 24 tubes to a rack. These tubes and racks were chosen because they were easy to handle on the desk where the blood samples are obtained. The diluent is added, 10 cc to each tube, by means of an automatic pipette.

Precision tubes are used to obtain readings on the colorimeter. These are purchased from the Leitz Co. The usual precautions are taken as to calibrations, cleanliness, absence of scratches, etc. Aliquot portions from the sampling tubes are transferred, after gentle inversion to mix, to these tubes. We would prefer to use one tube for these two procedures, but have been unable to obtain or have made a precision tube that would hold the dilution needed and not be unwieldy.

3. Pipettes for blood sample.

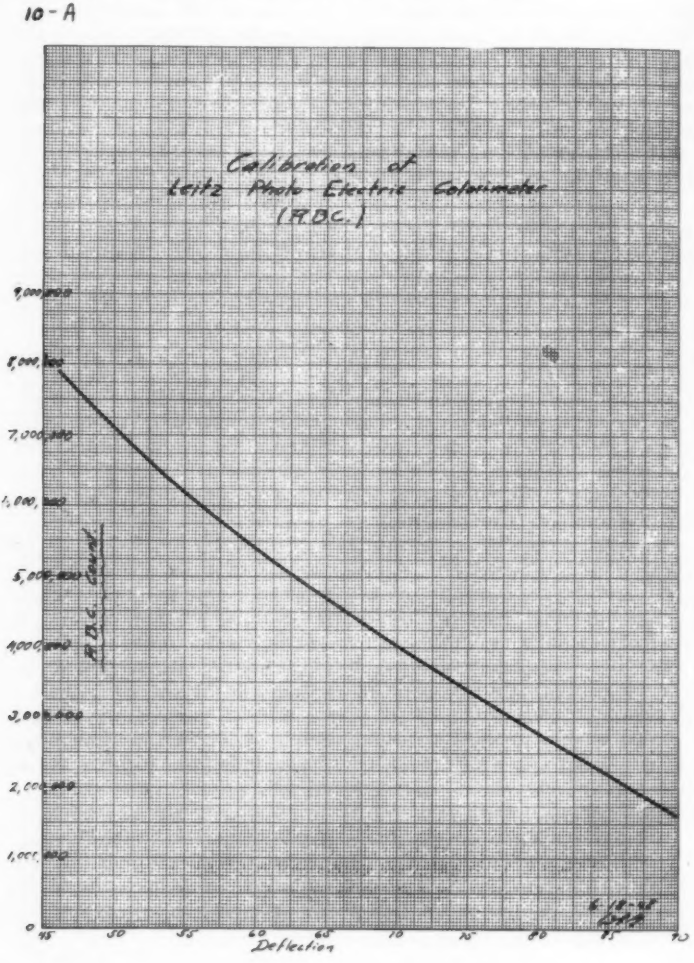
We use the Sahli pipette graduated at 20 cu. mm, measuring 0.02 cc. Some workers found that these pipettes were not too accurate. We also noted this but found greater accuracy when the product of one manufacturer was used. The calibrated pipette sold by A. H. Thomas Co. has given us the best results.

These pipettes may be recalibrated, but at rather great expense. Since we use some two hundred each day, and with the usual breakage, this would be quite a chore. The greatest difference we have had, has been one or a fraction of one deflection on the colorimeter scale. This represents about 150,000 cells, less than the permissible error in counting.

4. Diluting fluid.

Sodium chloride, 0.85% has been our choice. There are differences of opinion as to the best diluting fluid, but since we wished to use the same sample for hemoglobin, we concentrated on sodium chloride. We calibrated our instrument for Gower's solution, found results about the same.

Our chemists make this solution for us. It must be accurately prepared and the salt concentration checked. Samples are checked against blood counts and the previous solution used. We do a pH but it is not a reliable guide. Trouble manifests itself by great variations in count as compared to hemoglobin content and a hypotonic solution may cause hemolysis.



5. Calibration

This is the preparation of a chart whereby the galvanometer readings may be directly transcribed into red blood cells per cubic millimeter of blood, and hemoglobin in grams per 100 cc of blood.

We used the blood of two healthy young men on the Medical staff. The blood was drawn into an oxalate mixture, that used by Wintrobe for sedimentation rate, and then pooled. Using certified instruments, six careful counts were made on the hemacytometer. Hemoglobin estimations were made by acid hematin, and sodium carbonate, methods, and a reading obtained on the spectrophotometer. A sedimentation rate, hematocrit, and a cell diameter curve were made.

Dilutions of this blood were made, in duplicate, using a Sahli pipette.

1. 20 cu mm blood	5 cc saline
2. 20 cu mm blood	7.5 cc saline
3. 20 cu mm blood	10.0 cc saline
4. 20 cu mm blood	12.5 cc saline
5. 20 cu mm blood	15.0 cc saline
6. 20 cu mm blood	20.0 cc saline
7. 20 cu mm blood	25.0 cc saline
8. 20 cu mm blood	50.0 cc saline
9. 20 cu mm blood	100.0 cc saline

Readings were made on the colorimeter, using the green filter.

The same dilutions were made for the hemoglobin readings, except that they were made up to 10 cc, a drop of concentrated hydrochloric acid added and after ten minutes made up to the volumes directed.

RED CELLS

Deflection	rbc per cu. mm.
59	5,570,000
60	5,420,000
61	5,270,000
62	5,130,000
63	4,980,000
64	4,840,000
65	4,700,000
66	4,560,000
67	4,420,000
68	4,280,000
69	4,150,000
70	4,020,000
71	3,890,000
72	3,760,000
73	3,640,000
74	3,520,000
75	3,400,000

HEMOGLOBIN

Deflection	Gms per 100 cc
63	17.6
64	17.0
65	16.4
66	15.8
67	15.2
68	14.7
69	14.1
70	13.5
71	13.0
72	12.5
73	12.0
74	11.5
75	11.0
76	10.0

From the readings thus obtained, a curve was drawn and calibration charts prepared covering a range of 2,500,000 to 8,000,000 red cells and 8 to 32 grams hemoglobin.

These two charts are entirely separate and the deflections have no relation. The sample is read for red cells, hydrochloric acid added and after a period of 10 to 15 minutes read again. The values for the readings are obtained from the charts.

RESULTS AND COMPARISONS

Some two hundred duplicate counts were made before attempting this method as a routine procedure. One sample was obtained for the photoelectric colorimeter and one for the hemacytometer. Hemoglobin was determined on the same sample as the photoelectric count, and another sample using sodium carbonate and the colorimeter. Some of the results are given below.

Photoelectric Count	Hb	Hemacytometer Count	Sod. Carb. Hb
5,340,000	16.3 gms	5,200,000	16.7 gms.
5,120,000	14.7	4,800,000	14.8
5,230,000	15.7	5,140,000	15.7
4,790,000	13.0	4,580,000	13.9
4,900,000	14.7	5,340,000	14.4
5,340,000	16.3	4,500,000	15.7
5,100,000	14.7	5,350,000	14.8
4,790,000	13.6	4,230,000	13.5
4,790,000	13.6	5,400,000	14.0
5,120,000	14.7	4,220,000	14.8
4,620,000	13.0	4,410,000	12.2
5,230,000	16.3	5,390,000	13.5
5,200,000	15.7	4,390,000	13.5
4,790,000	14.7	4,490,000	14.8
4,900,000	15.2	4,750,000	14.8
4,900,000	15.5	5,160,000	16.2
4,670,000	13.6	5,080,000	14.2

As the technical group became accustomed to this method it was found that errors due to technic began to disappear. We use the ear and the photoelectric method requires a larger sample necessitating a deeper cut. Inaccuracy at this point, as in any count can invalidate the results.

We established two rules that give us a constant check on our apparatus as well as possible pathology. All Stat, Dispensary, and follow-up counts are taken in duplicate, one for the photoelectric and one for a count on the hemacytometer. In addition a 3% solution of cobalt acetate is used to check the instrument readings.

Thus far we have spoken of counts in the so-called normal range. Most of our work falls within this category. However we are looking for possible abnormal counts so our prime concern was whether we would miss them with this method. Most of our counts are complete, thus slides are available for examination of cells.

Our experience has been that abnormal counts stand out more or less like a red light, calling attention to the need for a check. Once a base line was established for low counts, they were more consistent in follow-ups on the photoelectric colorimeter than on the hemacytometer.

A hypotonic saline solution, or some abnormality in the cells themselves which causes them to swell in the diluting fluid, reveals itself by a low count. The hemoglobin will be within a normal range. If both the count and hemoglobin are low it may mean an iron deficiency. The decreased density of the cells permits the transmission of more light, hence the low count. Some examples are given.

Date	Photo-Electric Count	Hb	Hemacytometer Count	Haden-Hauser Hb
Case No. 1				
.....	2,910,000	9.5 gms	4,250,000	9.5 gms
Slides showed hypochromia and moderate anisocytosis.				
Case No. 2				
8/4	2,800,000	10 gms	.....	.....
8/6	2,800,000	9.5 gms	4,280,000	9.5 gms.

The two examples given below are from cyanosis cases resulting from chemical exposure.

Date	Photo-Electric Count	Hb	Hemacytometer Count	Haden-Hauser Hb
Case No. 1				
1/6	4,020,000	13.5 gms.	4,650,000	14.0 gms.
1/7	4,280,000	14.0	5,020,000	15.0
1/10	4,700,000	14.7	5,000,000	15.0
Case No. 2				
9/1 A.M.	2,800,000	8.5 gms.	.....	.....
9/1 P.M.	2,800,000	9.0	2,930,000	9.0 gms.
Hematocrit 29 marked anisocytosis.				

9/3	2,600,000	9.0	2,610,000	9.5
9/7	.....	.....	3,560,000	10.5
9/13	4,150,000	13.0	3,990,000	13.0
Hematocrit 40				
9/21	4,420,000	14.0	3,970,000	.....
9/27	4,560,000	14.7	4,540,000	14.5
10/11	4,700,000	14.0	4,540,000	14.0
11/4	4,700,000	15.2	.....	.....

R B C apparently normal.

The following case was followed very carefully, a loss of blood occurring after a pelvic injury. We had had a routine count six months previous.

Date	Photo-Electric Count	Hb	Hemacy-tometer Count	Haden-Hauser Hb
7/12/48	4,780,000	14.4 gms.	.....	.....
1/10/49	3,640,000	12.0	3,960,000	.....
1/13	3,520,000	11.5	3,810,000	12.5 gms.
1/14	3,400,000	10.5	4,150,000	10.5
1/16	3,650,000	11.5	3,970,000	11.5
1/18	3,460,000	12.0	3,930,000	12.0
1/20	4,020,000	13.5	4,460,000	13.0
1/25	4,280,000	13.5	4,440,000	13.5
2/22	4,420,000	14.0	4,440,000	13.5

At the other end of the scale we sometimes get counts of 6,000,000 and over with 18 gms or more of hemoglobin. A check count may agree, or give us a normal count. This may occur on the same individual at intervals, or on a group from the same area. Since the workers are exposed to chemicals, some of which may produce methemoglobin in the blood, we plan to study what part, if any, this may have in giving the high count on the colorimeter. Since cell density determines the amount of light transmitted this may be the answer.

Conclusion

In spite of adverse criticism which any new method may expect, and the errors which creep in, we feel that the estimation of the red cell count and hemoglobin on the same sample of blood has more than justified itself in our laboratories. We have to date made more than 20,000 counts with it. It has not only

saved time in screening our work but has done away with the monotony of counting.

We know of no abnormal count that has been missed. The tendency has been to over-accent any abnormality in either the number of cells or hemoglobin. Because we do both determinations on the same sample we rule out differences in pipettes. If either is low it draws immediate attention.

In our laboratories one technician is assigned the task of obtaining the samples in a separate room. A second Technician attends to the colorimeter work, while the actual counts and slide examinations are cared for by other technicians. Except in cases of interest only the laboratory clerk sees the completed results. There is no sub-conscious fitting of the count to the hemoglobin.

This method has not done away with the work but it has presented it in a new light. A new incentive has been added, and red cells have assumed a new aspect. Technicians now think in terms of light transmission, cell sensitivity, calibrations, clean glassware, proper saline solutions and cell suspensions. Constant comparison of the two methods and examination of slides has taught everyone that red cells are truly flexible and sensitive disks whose antics are unpredictable.

We do not feel that it is absolutely accurate. We do believe that in routine screening we get more consistent results than we get with the counting chamber. The photoelectric cell does not tire at the end of the day nor is it influenced by moods. It has not done away with counting, but now we have a definite reason for a careful check and have been surprised at the close comparisons. Occasionally we find bloods that cannot be counted with the colorimeter, but these have been few.

Other workers have found Gower's solution the best diluting fluid. We tried it and found very little difference. The objection was to the odor, and to the need for a second sample for the hemoglobin. Since we use the ear and 20 cu mm is a fair sized amount, twice this plus the white count and differential slides, meant a very deep cut, or a second cut. Our desire was to eliminate as much work as possible and saline seemed to meet our requirements.

We have used the Haden-Hausser instrument for hemoglobin checks for the same reason, it eliminates extra pipettes. We have the white pipette and can easily get a quick check. Another advantage is that it also is the acid hematin method.

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SERUM PHOSPHATASES

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My only reason for being here is to offer reassurance. It seems that there is a prevalent rumor that serum phosphatase determinations are endowed with almost humanly fiendish properties. In fact—

> A student I once knew someplace
> Said 'Stalin's politically a case.'
> 'Why not fix him for certain?
> He'd rip his Iron Curtain
> To avoid running one phosphatase!'

In these next few minutes I hope to familiarize you with these tests and their applications, so that you will see that they are really simple; Stalin could run one, and with ease.

Since many of the conditions in which serum phosphatase determinations are indicated concern bone pathology, the discussion must begin with a review of the chemistry of ossification. Briefly and simply, it is the production of osteoid tissue plus the impregnation of that tissue with certain characteristic calcium salts—simple, but effective—gives us our back-bone. Nor-

mally the reverse process, elution of these salts and resorption of the osteoid tissue, occurs in equilibrium with ossification. The processes of destruction and construction progressing in harmony and giving us new back-bone, every seven years, isn't it? In bone disease one or both of these processes have been 'loused up,' so to speak.

Now, apparently, although even the 'big boys' can't explain just how, these salts for bone impregnation are precipitated from body fluids and tissue fluids which bathe the bone. Impregnation proceeds to the extent that nearly half the weight of the bones is due to these salts, and spectrographic study shows that about 95% of this inorganic matter is a calcium-phosphate-carbonate compound, the CO_3 proportion being somewhat greater in mature bones than in maturing bones. Therefore, the calcium and phosphorus radicals are the active producers. They are precipitated according to their solubility in body fluid and their ionic availability. Serum calcium is, on the average, 5 mgs% calcium proteinate, 4.5 mgs% ionic form, and 0.5 mgs% diffusible calcium citrate.

If the precipitation of calcium phosphate is dependent on the solubility product, it is to be expected that if the concentration of either the calcium or the phosphate ions is increased, the other will be decreased, due to this precipitation. Experimentally and clinically this has been proven correct. This relationship is reflected in the relation between phosphate ions and total calcium in serum and is the reason for our 'rule of thumb' that, in repeated calcium and phosphate determinations on a patient, the product of the two results should be a constant.

The product of the calcium and phosphate ion concentrations is very close to the solubility product of the calcium phosphate precipitate, so if any mechanism raises the concentration of either of these ions, calcium phosphate should be precipitated, decreasing the ionic concentration of the other ion, as we just observed —which brings us to our topic.

A man named Robison, in 1923, suggested that such a mechanism exists at the sites of ossification in the form of an enzyme, phosphatase, capable of liberating inorganic phosphate from organic phosphorous compounds. He and other workers have substantiated the idea by measurements of phosphatase activity in tissue cultures of ossifying and non-ossifying tissues. However, many times phosphatase is present and no ossification occurs. Therefore it is presumable that phosphatase may be necessary but that other conditions must be suitable. There may be a second mechanism, also enzymic, producing the organic phosphorous compound essential for the phosphatase contribution to ossification.

This knowledge lay around unused for seven years and was of no particular interest to clinicians or technologists until Kay, in 1930, published the further information that its activity in plasma is increased in various conditions, but particularly in bone diseases. The significance of the increase has been variously interpreted: Kay says it is either the result of over-production of bone in attempted compensation for the lesion, or a forced exit from the diseased bone due to mechanical stress. Bodansky and Jaffe regard its activity as an index of the bone's capacity for cellular activities. Franceen and McLean theorize that it is synthesized by osteoblasts. You may take your choice, but remember the last-named theory; it will be borne out in later discussion. The fact remains, however, that some bone diseases are accompanied by elevated serum phosphatases.

Rickets is a good example of the efficiency of phosphatase determinations. As you know, in rickets new osteoid tissue is formed but fails to calcify, while decalcification of old bone proceeds according to schedule. For long years, one diagnostic rule was that serum showed a normal calcium level with a decreased phosphate level, and further, that if the product of the two fell below 30, rickets developed, whereas if the product stayed above 40 the child escaped this disease. Exceptions, however, were found to be numerous. Many workers, notably Bodansky and Jaffe, have found that clinical diagnosis of rickets agrees with the use of lowered serum phosphate as a laboratory diagnostic measure in only 19.8% of cases, with use of positive X-ray findings in 26.7%, but with the use of increased serum phosphatase as a guide, the agreement was found in 65.2% of cases. While Bodansky's normal range for children is 5-13 units, rachitic children have serum phosphatase levels of 15-60 units, and on most severe types, as high as 190 units. Further, the drop in serum phosphatase following vitamin D therapy offers a good criterion of recovery. With this vitamin relationship in mind it follows that hyperparathyroidism shows elevated values also.

In bone infections, reparative processes are not very active, so phosphatase determinations are of no diagnostic value, being normal. This is also true of benign bone tumors. Such statements may sound erroneous, but are logically explained by the realization that the active cells are not, either actually or potentially active bone formers. Chondroma, hemangioma, and giant-cell tumors are examples. Plasma cell myeloma, although a form of malignancy affecting bone, is accompanied by normal phosphatase values, an expected fact when viewed in the light of the knowledge that bone is destroyed but not formed.

In osteogenic sarcomas, although the chief characteristic is a malignant degeneration of the bone-producing cells, bone forma-

tion and destruction may go on in the same tumor. In fact, one basis for differentiation in classifying these tumors is the ratio of the formation to the destruction. Here, by virtue of the formation, serum phosphatases are increased; where formation is predominant, the tumor is osteoblastic and is characterized by very high phosphatase activity—20 to 40 times the normal. This bears out the theory of Franceen and McLean that phosphatase is a product of the osteoblast and in numerous cases it has been proven to be the product of malignant osteoblasts. Excision or irradiation led to decreases in serum phosphatase activity. Renewal of growth or metastases were accompanied by large increases of activity in the serum. Sarcomas in which bone destruction is predominant (the osteolytic type) would not be expected to show high phosphatase activity and they do not. Calcification proceeds normally, although it is inefficient in the face of pathological destruction. Thus the pathological condition exists without altering the serum chemistries. Paget's disease shows normal calcium and phosphorus values, but the phosphatase values are markedly increased, as is understandable from the histological picture.

Carcinomatous metastases to bone show high phosphatase values with normal serum phosphates and only slightly elevated calciums. The explanation here parallels that for osteogenic sarcoma.

If those of you who are not interested in bone pathology are still awake, now is the time for you to start listening again. Phosphatase activity is of some significance in some other conditions. You may be familiar with Dr. Meyer Bodansky's exhaustive research into the biochemistry of pregnancy. (Let me say in passing that the research was his; the exhaustion belonged to his technologists!) If so, you will recall that the average values of serum calcium decrease during pregnancy, average values for serum phosphates fall slightly then increase again. The serum phosphatase level shows a steady and marked increase throughout. This is explained on the basis of fetal demands and the consequent reactivity of the maternal skeletal structure. The normal value for adults is 1.5-4 Bodansky units and averages 2.6 units. During pregnancy it rises from 2.9 to 6.6 at term. I am just throwing this in, as, obviously, a serum phosphatase test is a poor diagnostic test for pregnancy.

There is, however, a large class of diseases affecting serum phosphatase, notably those of the liver. In obstructive jaundice, phosphatase is elevated, usually above 10 units. When obstruction is due to stones and jaundice is intermittent, such elevations are not encountered. Phosphatase is essentially unchanged in hemolytic jaundice. In jaundice of hepato-cellular origin, disagreement is the order of the day; some authors report consistently low values while others show distribution below and

above 10 units to be fairly equal. Neoplastic liver involvement shows consistently elevated values, so the main interest is in differentiation between obstructive and non-obstructive jaundice, since in the latter normal values are encountered. It should be remembered that clinical evidence must be carefully weighed against the results and obviously the co-existence of bone disease must be excluded. When this exclusion has been made, a serum phosphatase of over 10 units in a consistently jaundiced patient is a strong indication of pathological destruction.

In the actual testing, serum is incubated with a sodium glycerophosphate substrate and one Bodansky unit is equivalent to one milligram of phosphorus, liberated from this substrate as the phosphate ion, during one hour at 37 degrees Centigrade.

There are two methods in wide use: Bodansky's original, or the combination of that method with the Fiske-Subbarrow method for serum phosphorus. In both, one cc. of serum is incubated with the sodium glycerophosphate substrate for 60 minutes at 37 degrees Centigrade and immediately cooled in ice water for an abrupt cessation of phosphatase activity. The higher protein content of plasma makes it unsuitable for use; serum only can be treated in this manner satisfactorily. The original method has the advantage that the color, developed with acid molybdate and stannous chloride is instantly readable and is stable for two hours. The disadvantage is that correction must be made for any deviation from Beer's Law. The modified method does not yield such stable color, but requires no deviation correction. For details of method consult Hawk and Bergeim, 11th edition, for the original, or Bray's 3rd edition for the modified. Either gives explicit directions which you can peruse in the solitude of your own laboratory.

If you use the Fiske-Subbarrow method for phosphorus determinations, it would be wise to choose the modified method for serum phosphatase. It then becomes necessary to make few changes to add this determination to your list of 'can-do's.' After the hour's incubation you simply use that material and run it along with the regular phosphorus, substituting the substrate and serum for the serum alone in the regular test. Subtraction of the value for serum phosphorus from the total phosphorus obtained by incubation gives the serum phosphatase in Bodansky units. That's all there is to it. No separate standard solutions are necessary, since the phosphorus that is liberated from the substrate is chemically and physically identical with the phosphorus ordinarily tested in the serum.

Alexander B. Gutman in 1942 demonstrated phosphatases in body fluids and secretions which act optimally at various pH reactions. One of these, called acid phosphatase, reacts best at a pH of 5, and is present in the blood of all individuals in minute

amounts. However, the glandular epithelium of the normal adult prostate contains large amounts. In carcinoma of the prostate, this phosphatase is formed in even larger amounts and when metastasis occurs, this acid enzyme enters the blood stream. A determination of this acid phosphatase in serum is of definite diagnostic value therefore, in prostatic tumor differentiation. Here, at last, is one 'blood test for cancer.' The determination is simple; do it just like the alkaline phosphatase, merely substituting an acid substrate for the incubation. The actual preparation of this substrate is also given in Bray's 3rd edition.

There are only a few precautions to be observed: Hemolysis gives a false increase of the acid enzyme, but has no effect on the alkaline; the phosphatase in the erythrocyte is acid reacting. Absorption of carbon dioxide in the alkaline substrate causes significant error, but does not affect the acid substrate. A layer of petroleum ether protects the alkaline substrate from such contamination, but a wise and added precaution may be observed by running a water blank with each day's testing; use water in the place of serum and incubate it with the actual test, running it through in the same manner as the test sample. For both tests, serum only is suitable and it must be fresh. Acid values fall and alkaline values rise after more than one hour at room temperature or three to four hours in the refrigerator. So—

In drawing blood, don't hemolyze it;
Your GU man would criticize it.
Cover your substrate with petroleum ether.
Into the substrate don't blow your breath, either.
When your blood is first drawn, get right at your work.
Remember, it's easy! You won't go berserk!
Just choose the right substrate and warm it up first;
Use acid for prostate to find out the worst.
Then put in the serum; be careful in timing;
For time is important when you are enzyming!
In Ricket's or Paget's, the values will soar;
Where osteoblasts gather, they soar even more;
Where bony formation exceeds the destruction,
Or in the event of biliary obstruction.
What I know without telling is
My verse is atrocious!
But what I am selling is
This test ain't ferocious!
I hope I have sold you;
There's nothing much to it.
Remember, I told you
Even Stalin could do it!

SOME CLINICAL AND IMMUNOLOGIC FEATURES OF SYSTEMIC FUNGUS INFECTIONS*

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In the first place, I want to express my appreciation for the invitation to speak to this group of medical technologists. All of us who are concerned with the problems of medical care are becoming increasingly aware of the fact that these problems can be solved only by the development of work teams, of which the medical technologist along with nurses, pharmacists, administrators, social service workers and others has become a very important member. The necessity of such teamwork is emphasized in the problems of diagnosis and treatment of fungus infections because the diagnosis can be established only by the finding and accurate identification of the etiologic agents. Unfortunately there are few physicians who have had sufficient training to enable them to make an accurate mycologic diagnosis of systemic fungus disease, and this burden therefore, falls on the shoulders of the medical technologist. I certainly am happy that Miss Campbell** is here to do the really difficult and more important job of presenting the details of the isolation and identification of these pathogenic fungi, which leaves to me the much easier task of discussing some of the clinical and immunologic features of the systemic fungus infections.

The specific mycologic diagnosis assumes a most important role because of the great variations in the clinical pictures of certain of the systemic mycotic diseases, especially in those infections in which the lungs are involved. Clinically, pulmonary fungus infections are confused very easily with certain bacterial infections of the lungs, such as tuberculosis, with malignancies and, in some cases, with virus infections such as atypical pneumonia.

Clinically, the mycotic infections can be divided into three general groups, depending upon the tissues primarily involved—namely (1) the dermatomycoses, or superficial fungus infections, which involve only the skin, hair or nails, (2) a group of infections in which the skin and the subcutaneous tissues are invaded but the rest of the body usually is unaffected and (3) the true systemic mycoses, in which the lungs, bones, brain and certain internal organs are involved. In the last group, the skin and subcutaneous tissues also are infected frequently.

* Presented before ASMT Convention, Roanoke, Va., June, 1949.
** See March, 1950, A.J.M.T.

The superficial dermatomycoses, often referred to by such descriptive and colorful terms as athlete's foot, jockey itch, barber's itch, ringworm, etc., are by far the most common type of fungus infections encountered all over the world. Although many of these patients develop an exquisite degree of hypersensitivity to the fungus or its products, antibody responses, as detected by serologic methods, are feeble and relatively unimportant.

In those fungus infections which involve only the skin and subcutaneous tissues, the clinical picture often suggests mycotic disease, and the diagnosis is not too difficult because of the ready availability of materials for smear and culture. These infections, namely sporotrichosis, maduromycosis and chromoblastomycosis characteristically produce chronic lesions of the skin and subcutaneous tissues and the patients rarely show any signs or symptoms of systemic disease. There usually is little or no febrile response and, except for the unsightliness of the lesions, the health of the patient is unimpaired. In one of the infections, sporotrichosis, the clinical picture usually is sufficiently characteristic to establish a diagnosis but in all cases, confirmation should be made by culturing and identifying the organism.

It is the third group of systemic mycoses which are the most interesting, the most serious to the patient and the most difficult to diagnose clinically unless the patient's infection has progressed to the stage where skin and subcutaneous lesions are present.

In the United States there are three important systemic mycoses in which the organism gains entrance from an exogenous source. There also are three important systemic mycoses in which it is thought that the infection is primarily endegenous in origin. This discussion will be limited to these six mycoses, all of which are capable of causing progressively severe and often fatal infections in man.

The differentiation of the systemic mycoses into two groups, according to whether or not the source of the infection is exogenous or endogenous, is of more than academic importance since there are certain definite clinical, epidemiologic and mycologic differences between the infections caused by these two groups of fungi. For example, progressive and severe infections caused by the fungi by exogenous origin are much more common in males than in females, with ratios of 6 to 1 or higher, depending upon the specific disease. The results of large scale skin testing surveys have indicated, however, that both sexes are infected in about equal proportions, and it must be concluded that females either are more resistant to progressive infection than are the males or that the males are exposed to heavier dosages of organisms as a result of their occupations. Such a striking difference in the incidence of infection in males

and females is not found in those fungus infections of endogenous origin.

Another important difference between infections caused by these two groups of organisms is the observation that mycoses caused by the exogenous group of organisms are found most commonly in rather well defined geographical areas. Coccidioidomycosis occurs in the southwestern United States, histoplasmosis is found most often in the Mississippi valley regions and blastomycosis in the Mississippi valley region and the southeastern United States. In contrast, fungus infections of endogenous origin occur in all parts of the United States.

From the laboratory standpoint, it is of interest to note that the exogenous fungi capable of causing systemic disease are all moldlike when cultured on Sabouraud's medium at room temperature, whereas the endogenous fungi *(Candida albicans, Cryptococcus neoformans* and *Actinomyces bovis)* grow as colonies which resemble those of certain bacteria or yeasts. Lastly, the finding of a fungus belonging to the exogenous group in materials from a patient unquestionably establishes a diagnosis of a mycotic infection. On the other hand, the finding of any of the endogenous fungi in such material does not necessarily signify serious disease, since these fungi can be found in many people who apparently are quite healthy. Furthermore, one of these fungi, *Candida albicans,* is found very frequently in sputa from patients with pulmonary tuberculosis, lung abscess and malignancies.

Blastomycosis is an infection of two sharply defined clinical types, depending upon the mode of entrance of the fungus into the body. In the first type, designated as cutaneous blastomycosis, the infection almost always begins on an exposed part of the body as a chronic lesion which slowly spreads peripherally. The lesion has a granulomatous appearance and is characterized by its heaped up borders which contain minute abscesses and in which the fungus can be demonstrated easily. Cutaneous blastomycosis rarely becomes disseminated and usually heals readily under vaccine and x-ray therapy. The skin test to vaccine is positive and serum antibodies usually are absent unless the disease is widespread. Systemic blastomycosis, on the other hand, begins with infection of the lungs from which location the organisms disseminates to other parts of the body, especially the bones, subcutaneous tissues and the brain. Skin lesions may appear as a result of rupture of subcutaneous abscesses and, in contrast to cutaneous blastomycosis, these lesions can be found in the skin of all parts of the body such as the abdomen, thorax and the back. The primary pulmonary lesion frequently is diagnosed incorrectly as a pulmonary malignancy or tuberculosis. In these cases, it is most important to find the fungus since lobectomies have been performed because of the mistaken impression

that the lung lesions were carcinomatous. The skin tests may be positive or negative depending upon the extent and duration of the infection, but the skin test is important in that it bears a relationship to the prognosis of the patient. A negative skin test in a patient with systemic blastomycosis indicates a very poor prognosis and it is interpreted in our clinic as an indication of a state of anergy to the fungus, similar to that observed in widespread and disseminated tuberculosis. The serologic tests which may be either positive or negative, again are of value in estimating prognosis. In general, the prognosis is worst in patients with a high titer of serum antibodies and a negative skin test and, conversely, is best in patients with negative or low antibody titers and a positive skin test.

Progressive coccidioidomycosis is a highly fatal disease and much of what has been said about blastomycosis is applicable also to this infection. Most important, however, has been the demonstration that a primary, and usually benign, form of pulmonary infection is extremely common in the endemic areas in the southwestern part of the United States. The primary infection may be silent or the patient may have a febrile illness which often has been designated as "valley fever." The occurrence of erythema nodosum in a considerable percentage of patients has led to the picturesque term "desert bumps." The clinical picture of coccidioidomycosis may be likened to that of tuberculosis in that there is a primary pulmonary infection which, in most instances, heals spontaneously, leaving areas of calcification in the lungs. In a relatively small percentage of patients, particularly males of the darker skinned races, such as Negroes, Filipinos, and Mexicans, the infection often progresses with the development of granulomatous lesions all over the body. The immunologic findings are analogous to those described above for blastomycosis, in that the skin tests are strongest in patients with benign pulmonary coccidioidomycosis and weakest or negative in those who develop the progressive form of the disease. Likewise the antibody titer rises in patients who develop the disseminated and fatal form of the infection.

The story of histoplasmosis is a relatively recent and particularly exciting one due to the finding that a considerable number of apparently healthy individuals who live in the Mississippi valley region and who have calcified areas in the lungs, are hypersensitive to histoplasmin, a product of *Histoplasma capsulatum*. Until a few years ago, histoplasmosis was considered a rare and almost uniformly fatal disease which, like the others mentioned above, occurred most frequently in males. This fatal form of the infection, however, differed from blastomycosis and coccidioidomycosis in that children were frequent victims of the disease. The clinical picture also is quite different from that of the other

two diseases in that the infection involves primarily the reticulo-endothelial system. The most commonly observed characteristics are those of a large spleen, large liver and progressive anemia. The clinical and pathologic findings suggested that the portal of entry was the gastro-intestinal tract and not the lungs. Such a view has had to be modified in view of the demonstration of histoplasmin-positive, tuberculin-negative reactions in a high percentage of healthy adults with calcified lung lesions. Unfortunately, a clear cut clinical picture of primary pulmonary infection with this fungus has not been demonstrated as has been the case with coccidioidomycosis. The fungus has been found in the lungs of patients who died accidental deaths but so far as is known, the primary infection, if it does exist, must be clinically "silent." Miss Campbell has done much work on the mycology and immunology of this disease and it is my hope that she will discuss the problem in her paper.

The three important endogenous infections are actinomycosis, moniliasis and cryptococcosis. It should be emphasized that the inclusion of cryptococcosis in this group is made with some hesitation, since pathogenic cryptococci have been isolated from natural sources and also from the skin and feces of normal individuals.

Actinomyces bovis is found in tonsils and around pyorrheal teeth of otherwise healthy individuals, from which vantage point, the fungus is able to invade other tissues of the body when the proper circumstances occur. Cervicofacial actinomycosis is the most common form of the infection and frequently appears after some trauma to the mouth such as the extraction of a tooth. Pulmonary infection also occurs, presumably by aspiration of materials from the mouth, and usually is unsuspected until draining sinuses appear over the chest wall. The abdominal form is the most dangerous and may appear in the vicinity of the scar resulting from an appendectomy. There are no satisfactory skin tests or serologic tests and the diagnosis must be made in the laboratory by examination and culture of materials from draining sinuses. Fortunately, sulfonamides and antibiotics are quite effective in inhibiting the growth of the organism and since this type of therapy has been instituted as an adjunct to surgery, the prognosis in actinomycosis has brightened tremendously.

Moniliasis probably produces a greater variety of clinical pictures than any of the other fungus diseases. Not only can this fungus produce lesions of the skin and nails, like the dermatomycoses, but it also produces thrush in infants and debilitated persons and in patients with poor fitting dentures. Monilia vulvovaginitis is a very troublesome and annoying infection. The fungus also can invade the lungs, produce generalized infection and even meningitis. The diagnosis of pulmonary moniliasis is particularly difficult to make since the pathogenic *Candida albicans*

can be isolated frequently from a great variety of pulmonary disorders caused by other etiologic agents. It must be emphasized that a diagnosis of pulmonary moniliasis should be made only after repeated demonstrations of the fungus in the sputum by *direct smear* and after careful exclusion of other possible causes of the patient's symptoms. Skin tests cannot be relied upon for diagnosis since a high percentage of normal individuals give positive reactions. By proper techniques, agglutinins also can be found in many normal individuals. In spite of this fact, it must be emphasized that skin tests and serologic studies should be done on all patients with moniliasis because they are of great significance in tetermining the type of therapy to be employed and in evaluating the prognosis.

Cryptococcosis in the United States usually takes the form of cryptococcal meningitis (Torula meningitis) and has a serious prognosis. In closing this discussion I would like to mention that we have seen two cases of completely silent pulmonary infection with *Cryptococcus,* and one patient developed meningitis and died. Since the organism apparently is somewhat sensitive to sulfonamides, it certainly seems worthwhile to make an effort to diagnose such cases of pulmonary infections and institute sulfonamide therapy with the hope that meningitis can be avoided. However, as yet there is no proof that the lungs represent the only portal entry in cryptoccal meningitis. There are no satisfactory skin tests or serologic tests in this disease.

RADIOCHEMISTRY

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It is a happy privilege to be here today and especially to have this opportunity as one who is in daily contact with medical technologists of expressing an appreciation of their training, conscientious efforts and the untiring labor of this national organization to maintain and elevate the standards of the profession.

My task in this symposium on radioisotopes is a general review of the field of radiochemistry and the functions of the radiochemist. Some of us have been fortunately endowed with enough sense and senses so that we do not succumb too quickly to all the natural and man made dangers that surround us. However, we have not yet reached that stage of evolution where we grow Geiger tubes as readily as other sensory organs. The work of the radiochemist is conditioned and the choice of operating procedures determined by the dangers inherent in the radiation we cannot see, taste, feel, smell or hear. Safety problems will be considered in detail in a later paper on this program.

What is the function of the chemist in this new team of scien-

tists who are using these new powerful weapons for the advancement of knowledge? In many respects the radiochemist, like the medical technologist has begged, borrowed and stolen from many diverse fields to create a new specialty. He uses especially the tools of physics, biology, mathematics and physiology as well as chemistry in all its ramifications. On the surface his task is comparatively simple. The radioisotopes prepared by the physicist are brought to the "hot" laboratory. Incidentally a "hot" laboratory is a place where radioisotopes are handled. The degree of danger and precautions are correlated with the amounts of radioactivity handled. "Hot" laboratories may be "cool" or "cold." In Washington we have improved on things a little bit. In the summer our "cool" laboratories are hot. It becomes the task of the chemist to take the radioisotopes prepared by modern alchemy in the atomic neutron pile or the cyclotron and to identify, separate and purify the elements that may be present in the mixture. For this job the traditional procedures of qualitative and quantitative analytical chemistry are employed. The desired radioisotope may be separated as an insoluble precipitate, by coprecipitation with an insoluble carrier, by solvent extraction procedures such as the removal of ferric ion from acid solution by extraction with ether or the use of natural or synthetic zeolites which selectively remove one element from another in a procedure similar to chromatography.

Two conditions may be met in this work. In the one case it is possible that the element formed by nuclear bombardment is different than the starting target. Such a situation has been presented by Dr. Copeland in the formation of Radioactive Iodine 131 from Tellurium 130. The separation of the radioactive iodine unaccompanied by any non radioactive iodine or any other element may be brought about readily. The volatile iodine may be distilled from the mixture with tellurium and collected in a carrier free form.

In the second type of situation exemplified by the conversion of Carbon 13 by neutron capture to Radioactive Carbon 14 a certain percentage of the carbon will be radioactive and the balance will be inert. The two isotopes are not separable by chemical procedures. The percentage of radioactive isotope in the mixture is indicated by the "specific activity" of the sample which represents the ratio of active to inactive element. Frequently it is of very considerable importance in physiology and therapeutics to know very carefully the extent of the dilution of the radioactive material with its inert twin, as Dr. Copeland will illustrate.

The next step in the work of the radiochemist on this team is the conversion of these separated and purified isotopes into the form desired by the next investigator. If the material is to be

used by mouth it is sometimes sufficient to bring an acid solution to neutrality quantitatively and further control the chemical and radioactive content. For materials used by injection it may be necessary to bring the isotope into physiological pH range and isotonicity. Unusual problems come up in this type of work. In the early days sterilization of solutions of radioactive phosphorus resulted in extensive loss of active material. After investigation it was learned that the acid phosphate radical was held to the surface of the alkaline glass of the ampoule. By carefully adjusting the pH this loss could be minimized.

When the needs of the experiment require a more complicated chemical formulation new problems arise. The situation is analogous to the problem you would face if every time you needed a pair of nylon stockings you had to make them from coke, lime, air and water. If the fate of acetic acid in the body is to be studied using radioactive carbon containing acetic acid it becomes the function of the chemist to prepare the material. In this case he might convert the radioactive barium carbonate obtained from the Oak Ridge Plant to carbon dioxide, then to methyl alcohol by hydrogenation under pressure, then to methyl bromide by reaction with phosphorous tribromide, then to acetonitrite by reaction with alkali cyanide and finally to radioactive acetic acid by hydrolysis. This material now becomes available for biological study. The procedure outlined above is simple compared to that needed for the preparation of more complex compounds such as proteins, vitamins and hormones. Sometimes it is possible to induce nature to do the work. For example it is possible to feed radioactive carbon dioxide to a growing plant, after a time harvest the leaves and separate the radioactive sugar that has been manufactured.

After the desired radioactive compound has been prepared its metabolic course through the body may be studied. Classical biochemical procedures such as protein fractionation followed by reconversion back to the element in a form suitable for radioactive measurement, as by digestion, make possible the determination of the physiological fate of a given compound.

In working with radiocarbon it is possible to burn the organic material, recover the carbon dioxide formed by solution in alkali, and then precipitate the carbonate for radioactive measurement. It happened that some samples of radioactive barium carbonate lost five to twenty percent of their activity on standing over night. The explanation of this phenomena was ultimately shown to be the exchange of the inert carbon dioxide in the air with radioactive carbon dioxide in the solid barium carbonate sample.

This short review of radiochemistry and the function of the radiochemist may serve as an introduction to Dr. Copeland's discussion of the medical applications of the radioisotopes.

RADIOISOTOPES—GENERAL CONSIDERATIONS: NEWER APPLICATIONS OF RADIANT ENERGY IN CANCER RESEARCH AND THERAPY*

MURRAY M. COPELAND, M.D.
Professor of Oncology, Georgetown University Medical Center, Washington 7, D. C.

The rapidly expanding program of medical research with radioactive and stable isotopes has caught the interest of investigators in all the specialties. Many radioisotopic materials are now becoming available for research in this country and abroad. Because of the interest which has been stimulated in this field of endeavor, it seems worthwhile to review some of the historical milestones in this type of work, the biologic possibilities, and a few of the practical problems which face the investigator.

The possibility of the transmutation of matter has held the interest of the human mind since early in the Christian era. The persistence of this idea through the centuries was greatly sustained by the views of Aristotle on the nature of matter. According to this view, all bodies were composed of the same primordial substance and the four elements, earth, fire, air and water, differed from one another only in possessing in varying degrees the qualities of cold, wet, warm and dry. It is little wonder that alchemists of that day continually sought a method of bringing about the transmutation of one substance into another. From time to time extravagant claims were made but no evidence remains that transmutation was accomplished.

With the advances of knowledge it became apparent that matter could be resolved into eighty or more elements, the atoms of which were considered permanent and not subject to dissolution. In 1896 Becquerel discovered naturally-occurring radioactive properties in uranium compounds, exploding the idea of permanency for the atom. In 1898 several discoveries followed each other rapidly. Thorium was found to be radioactive; the Curies discovered the elements of polonium and radium, finding them to be strong emitters of the new radiation.

The radiation from the radioactive substances, after intense study, was found to consist of three sharply distinct components which were given the names of alpha, beta and gamma rays. Powerful physiological effects were almost immediately revealed. The application of these agents to the treatment of cancer soon followed, with only meager information about the physical properties of the radiation being utilized.

Through the succeeding years, increasing knowledge of the structure of the atom has notably enhanced the usefulness of radioactive substances in treating cancer and has stimulated scientists in their efforts to produce artificial radioisotopes. In 1934 Curie and Joliot found that, if certain elements were bom-

* Submitted June 20, 1949.

barded with alpha particles, positrons were emitted, and, if the source of the alpha particles were removed, the emission of positrons continued, but at a diminished rate. All radioactivity decreases with time and is expressed in terms of decay. By "decay" is meant that the amount of the original element present becomes less and less, as a result of the fact that the nuclei are disintegrating through the ejection of alpha and beta particles. When the remaining activity of the radioisotope represents one-half of the original amount, this becomes known as the "half-life." This factor is of great importance in selecting radioactive material for experimental or clinical use.

Artificial radioisotopes may be produced by bombarding atoms with various particles from other atoms, such as neutrons, protons, or alpha particles. The bombarding particle may remain in the nucleus of the element exposed; it may pass through the atom's nucleus; or it may knock out some portion of the nucleus. The newly formed or changed atom may be stable, or it may break down at once. Disintegration occurs over a measurable period of time in many radioactive substances. It is reflected in the emission of beta particles, gamma rays, or both. When such rays, emitted from a radioactive substance, strike near-by atoms, electrons may be thrown out of the atom's orbit and leave the atom conductive of electricity. Such an atom is called an "ionized atom." These ionized atoms, secondarily produced by the disintegrating radioisotope's emission of particles, make it possible to detect the presence of and the quantity of the radioisotope present. This measurement of radioactivity present is accomplished by the use of instruments called ionization chambers and Geiger-Muller counters.

The artificial radioisotopes may be produced by the cyclotron and by other types of generators which produce bombarding particles. The largest source of isotopes today, however, is neutron bombardment of elements by chain-reacting uranium piles.

Two general types of investigation with radioisotopes in the study and treatment of cancer are being carried out:

I. Because of the extreme sensitivity of detection and the unique specificity of the isotopes as tags, they are of tremendous value in identifying certain types of cells. They permit the study of the process of nutrition and growth, normal and abnormal; absorption; conversion; and assimilation and excretion of nutritive compounds in animals and man.

The employment of isotopes as biologic tracers is exemplified by the use of tracer iodine (I^{131}) in patients with thyroid cancer demonstrating that there is a fundamental difference between the normal and cancerous tissue of the thyroid gland. Because radioactive iodine, which emits both beta and gamma rays, has

specificity for thyroid tissue, it becomes an excellent tag for studying diseases of the thyroid gland. The rate of its disposition may be followed by simply holding a Geiger-Muller counter near the body.

Clinical studies on the uptake of tracer doses of radioactive phosphorus (P^{32}) by tumors of the breast have yielded some interesting observations. McCorkle and his associates have found that malignant tumors of the breast and related metastatic deposits show an increased absorption of radioactive phosphorus. Inflammations of the breast, with or without the presence of cancer, also showed such an increase in the absorption of phosphorus. This is of some diagnostic significance if the cancer or the infection is located in the superficial portions of the breast (not deeper than 0.5 cm.). Differential Geiger counter readings are made by comparing readings over the tumor with readings over other comparable parts of the body.

Recently radiophosphorus has been used to determine the effect of radiation on gastric acidity. Simon prepared a balloon with absorbent material over its surface which was then saturated with P^{32}. A second covering of thin rubber was then placed about the balloon covering the P^{32} saturated material. The balloon was introduced into Heidenhain stomach pouches in dogs thus exposing the gastric mucosa to continuous beta radiation until 20,000 equivalent roentgens or more were given in the first m.m. of mucosa. Marked cessation of secretory activity was noted up to 125 days of observation.

Labeled isotopes of iron Fe^{55} and Fe^{59} have made it possible to acquire information as to the paths taken by iron in both pathological and normal states. Radioiron metabolism studies of pathological states include pernicious anemia, hemolytic anemia, secondary anemia both from infection and from parasites and hemorrhagic iron deficiencies.

The use of various radioisotopes in tracer amounts as diagnostic aids, both in the detection of cancer and in the study of many other processes, may well be their most important use in the future.

II. A second type of investigation with radioisotopes in cancer is their employment to supplement or replace x-rays and radium in treating cancer and allied diseases. The problem is complicated and is encumbered with a complex combination of factors. The disintegration rate of radioactive atoms is specific for each element. The ability of the tissue for selecting the element or compound limits the amount of isotope absorbed. In spite of the array of variables encountered, radioisotopes have added another possibility of improved cancer therapy.

Let us refer again to the specificity of iodine for the thyroid tissue. Marinelli, Foote, Hill and Hocker have shown that

certain types of thyroid cancer possess ability to accumulate radioactive iodine (I^{131}) while others do not. The structure of the tumor is an important factor in determining this. The more cellular the growth, with absence of normal glandular arrangement, the smaller the amount of radioactive iodine that will be deposited in the gland. The consensus at the present time is that radioactive iodine has not been an effective method of treatment in thyroid cancer because of this and other factors. It must be said, however, that when human tolerance for radioactive isotopes is better understood, doses of greater intensity may be possible. To date, about 1 in 5 cases of thyroid cancer shows definite response to radioactive iodine.

Radioactive phosphorus (P^{32}) is deposited selectively in bone and in the nuclei of rapidly multiplying cells. It irradiates the blood-forming tissues and retards the production of blood cells by the bone marrow.

Clinical reports on the use of radioactive phosphorus on certain blood dyscrasias have been made by Erf, Kennedy, Hoster and Doan; Erf, Tuttle, and Lawrence; Lawrence, Low-Beer and Stone; Craver, Warren, Doan and associates, and Hall and others.

Erf reports 138 cases of polycythemia rubra vera which have been treated with radiophosphorus (P^{32}). The radiophosphorus was administered intravenously as a sterile isotonic solution of sodium acid phosphate, containing radioactive phosphorus. The average dose administered varied between 5 and 10 mc., and was given in from 1 to 20 c.c. of solution, according to the concentration of radiophosphorus. Since the life span of a red blood cell is about 100 days, the second dose of radiophosphorus, if needed, was not given until approximately 3 months after the first dose. Maintenance doses were given at 1 or 2 year intervals, as needed. The presence of secondary polycythemia or pseudopolycythemia was ruled out in all patients. Of 20 cases of primary polycythemia treated with P^{32} presented in detail by Erf, 17 showed satisfactory hematologic and clinical remissions of from 6 months to 3 years.

Leukopenic myeloid leukemia, as a terminal event in polycythemic patients receiving spray x-irradiation, has been reported by Tinney et al., as occurring in 10 per cent of patients so treated. None of these patients had been treated with radioactive phosphorus. Erf, in reviewing the results of clinics treating polycythemia with radioactive phosphorus, recorded 5 deaths, 3 of which were due to leukopenic myeloid leukemia. One naturally wonders whether the acute leukemic states which have occurred in some cases are due to the drug or are associated with the natural course of polycythemia.

Doan and his associates have recently published an analysis of the results in the treatment of 100 patients with radioactive

phosphorus, including polycythemia rubra vera, lymphatic, myelogenous and monocytic leukemias, Hodgkin's syndrome, metastatic carcinoma and sarcoma, mycosis fungoides, and exfoliative dermatitis. They found that radioactive phosphorus was of greatest value in controlling the clinical and hematologic manifestations of polycythemia rubra vera and was a valuable adjunct in treating some of the more chronic leukemic states, especially those cases which had become intractable to roentgen irradiation.

In myelogenous leukemia the blood picture was suppressed, but x-ray therapy was necessary to control the size of the spleen. Only an occasional brief favorable effect occurred in the acute leukemias. Hodgkin's disease could not be controlled by this therapy.

In four patients with multiple myeloma and five patients with malignant neoplasms metastasizing to bone, temporary relief from pain was obtained, lasting from two weeks to six months.

Manganese (Mn^{52}), sodium (Na^{24}) and radioactive gold (Au^{198}) have also been useful in treating chronic forms of leukemia and certain lymph-gland diseases, such as lymphosarcoma and Hodgkin's disease.

Radioactive manganese (Mn^{52}) is found in higher concentrations in the liver, spleen and bone marrow than in other viscera and is excreted almost entirely in the feces. The isotope has been given in a highly dispersed colloidal suspension by intravenous injection. Motley reports the treatment of 14 cases of Hodgkin's disease; nine cases of lymphoid leukemia, and three cases of lymphosarcoma with Mn.[52] The most favorable therapeutic results were obtained in Hodgkin's disease. The febrile and abdominal types particularly showed varying degrees of palliation. In cases of lymphoid leukemia treated with radioactive manganese the results were not superior to x-ray therapy. Two cases of lymphosarcoma showed little or no improvement after therapy. Hodgkin's disease was treated at intervals of three to four months, when necessary.

Because radioactive manganese was difficult to obtain, Hahn and Sheppard selected radioactive gold (Au^{198}) a beta and gamma ray emitter with similar properties of concentration in the reticulo-endothelial systems for study. Subsequently, Sheppard, Hahn and their associates have treated a number of patients with radioactive gold (Au^{198}). Gold sols were found to concentrate chiefly in the liver and spleen, as long as radioactive measurements could be made, indicating the fixation of the metal in the reticulo-endothelial tissues and, further, that the gold colloid was insoluble in body fluids. Because of the chemical characteristics of the metal, they also directly infiltrated the radioactive colloidal solutions of gold into tumor tissue and observed varying degrees of regression in some of the lesions so

treated. They pointed out that this material can be infiltrated into tissues which are inaccessible to x-ray and radium therapy. The cellular structure or vascularity of the tissue at times precluded the retention of solutions injected. Hahn et al., suggested that radioactive silver nitrate, with its cauterizing properties, could possibly be used as an alternative. In general the use of labeled colloidal materials is promising and deserves thorough clinical trial.

When radioactive sodium (Na^{24}) is administered orally or parenterally it rapidly makes its appearance throughout the body. The penetrating radiations emitted (beta and gamma rays) from the radioactive sodium can be readily demonstrated by a Geiger counter on the body surface. Radioactive sodium has not been used extensively in therapy because of its generalized distribution in the body and lack of concentration in the regions of rapid growth or cell division. Evans, Lenz, Donlan and LeMay (1948) reported the use of sodium (Na^{24}) in the treatment of 31 patients, having a variety of neoplastic conditions. Therapy varied with the condition to be treated, averaging from 20 to 40 millicuries total dosage at each administration. One patient received up to 476 millicuries, the dosage being distributed over a period of 353 days. The authors concluded that radiosodium therapy is not good when the disease is acute; when the radioresistance of the abnormal cells is high; and when the hemapoietic system is already damaged. They emphasized that the data were too few and the follow-ups too early to submit a final evaluation of the radiosodium therapy, and pointed out that the use of Na^{24} was limited to laboratories near the source of supply because of its short half-life.

Radioactive strontium (Sr^{89}) has been used to irradiate osteogenic sarcoma. Pecher and Treadwell and his associates report studies indicating its use in bone metastases and in certain bone tumors. There is evidence, however, that much danger exists in the therapeutic use of this metal.

Geschickter, Copeland and their associates are undertaking the study of Ca^{45} in the form of an organo-metal, both as a tracer and as a therapeutic agent in the treatment of neoplastic disease.

Studies of the isotope gallium (Ga^{72}) have been made by Dudley (1948), who explored some of its pharmacological activities. Gallium (Ga^{72}) has a half-life of 14.1 hours and is an emitter of negative beta rays and gamma radiation.

He has shown that dogs tolerate one millicurie of gallium (Ga^{72}) per kilogram of body weight, while rabbits show no untoward effects from two mc. per kilogram of body weight. The toxicity of the metal, per se, was the limiting factor which, in the above experiments, was administered intravenously at a level of from 5 to 7 mgms. of gallium per millicurie. The findings

in young rabbits which have received Ga^{72} are of considerable interest. In eight hours the radioactive substance is found principally at the epiphyseal junction of the long bones, the region of greatest osteogenic activity. In older animals the trabecular bone shows the greatest activity, while the peridontal tissues of both age groups exhibit an especial affinity for the injected gallium. An eight kilogram dog, which was found to have a spontaneous osteoplastic lesion of the foreleg, was given a single subcutaneous injection of 0.5 mc. of gallium (Ga^{72}) per kilogram of body weight. In 24 to 48 hours, Geiger counter readings indicated from 33 to 39 percent higher radioactivity over the osteoid lesion than over the same area on the opposite normal leg. There was no hematological changes noted in a period of 45 days.

From these preliminary studies it would appear that a new radioactive tool for study of bone metabolism has been found and that much may be accomplished in the field of osteogenic tissues by the use of the usable radioisotopes of gallium.

Despite the number of investigators who have made favorable contributions in the use of radioisotopes as therapeutic agents, the medical profession must make haste slowly in this direction. The realization of a tool to replace standard methods of radium and x-ray therapy is not yet at hand.

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EDITORIAL

This time try reading Article 3 of the By-Laws. The subject is dues. Dry? I don't know. It's time for them to be paid—almost. So we might just as well begin thinking about them. They are a very necessary part of our organization. As you will notice Section 1 says that each state may set its own dues at any point over and above the $5.00 a year which will be paid into the national society that it may deem wise or feasible. There is the state also which has district or local dues to pay. These may be set over and above those of the state and national dues. All this is local option. The American Society of Medical Technologists asks only its share of $5.00 per year from each member.

This year we are trying a rather new departure. By May 15th we had all statements addressed and mailed to the respective state treasurers. Those individuals residing in states which do not yet have an organization will, of course, receive their statements directly from the Executive Office and in turn will pay their dues directly to that office. The state treasurers will then mark their own addresses on their respective statements so that you will send your dues to the proper place. As for collecting the local dues, each state has its own individual method. In some the state treasurers will collect both local and national dues and remit to the proper place. In others the local treasurers will collect the dues for all and remit to the state treasurers who in turn will send such dues as are payable to the national society. We do not say which is the best way for this to be done. That is up to the individual state. However, with our getting the statements out to the state treasurers before June 1, these latter will have an opportunity to forward them to you so that you may pay your dues promptly this year.

The By-Laws state that dues are payable on or before November 15th. On that date those who have not already paid (and we hope there will not be many) we shall send out another set of statements to the respective state treasurers. Then a third and final notice will be sent to those who have neglected paying their dues about December 15th. That is giving those who are slow in remitting a month's time in which to pay their $5.00 dues without having to pay the $1.00 reinstatement fee which is

due after January 15. On January 15 we "pull" the cards and addressograph plates of those who have not paid their 1950-51 dues so that they no longer receive any JOURNALS; that is, the November issue is the last which will be received by those who default their payment of dues.

You will note that there is no difference in the dues paid by active or affiliate members of ASMT. In other words, the same rules regarding dues are payable by affiliate as by active members. Incidentally, if for any reason you are unable to pay your dues, please let us know the reason. We would very much like to have a record in the office of why you have defaulted in payment of dues. We consider any note to this effect a "resignation." This completes our records on you if you no longer feel that you can belong to the national society. We always dislike taking a name out of the files for any reason but we would much rather have you resign in good standing so that at some future time you may be reinstated without payment of back dues or any reinstatement fee than just have to drop your name without any explanation because of non-payment of dues.

We want to know if you feel you are getting value received for the amount you pay in to ASMT and if not, we will be happy to accept constructive criticism. After all it is **our** organization. We support it by our dues financially and by our spirit of cooperation and various activities.

Another point is the payment of one-half year dues by those who join the organization after January 1. Those applying for membership between July 1 and December 31, inclusive, receive all copies of the JOURNAL for those six months; that is, the July, September and November JOURNALS, even if they don't send in their application until December 31. Anyone joining after January 1st, if he prefers, may join as a full year member and receive those same back numbers of the JOURNAL although it must be clearly explained to these newcomers that they can belong from January 1 through June 30 of any year upon payment of half-year dues, and whether they belong for six months or one day they will receive the January, March and May issues of the JOURNAL as well as have the privilege of being counted for the delegation from their state in the House of Delegates meeting for that year.

For your dues, beside the other privileges of membership, you receive, of course, the JOURNAL. The AMERICAN JOURNAL OF MEDICAL TECHNOLOGY receives $1.50 for every full year member who pays dues and 75 cents for every one-half year member. Any old member who pays dues after January 1 still owes the full $5.00 and cannot come in as a new member and just pay half-year dues. That is an error that very few make, but it is made.

In regard to payment for the JOURNAL, since a part of your membership dues goes for this publication you are definitely entitled to receive all the issues for that period of time in which payment was made. Therefore, if, by some inadvertence you fail to receive all the issues of your JOURNAL, please let us know and we shall be happy to take care of the situation by making up for these numbers that you missed. However, if you move and your JOURNAL is not forwarded to you, as it cannot be under the Third Class permit by which we mail, you must, if you fail to let us know of your change of address in time, pay ten cents in coin or stamps to help defray the cost of remailing as these JOURNALS are returned to us and we must pay postage due on each magazine that is not delivered.

Please cooperate with us. Pay your dues promptly. Let us know of any change of address and if for some reason you cannot pay your dues for the year, please just drop us a penny post card and let us know so that you may be reinstated later without payment of any penalties. We need you old members. We want new ones.

R. M.

THE AMERICAN SOCIETY OF MEDICAL TECHNOLOGISTS EIGHTEENTH ANNUAL CONVENTION

Headquarters

SHAMROCK HOTEL
HOUSTON, TEXAS
June 11, 12, 13, 14, and 15

Program

SUNDAY, JUNE 11

8:00 A.M. Registration Opens
1:00 P.M. Advisory Council Meeting—Castilian Room—The Shamrock
6:00 - 8:00 Reception—Grecian Room—The Shamrock

MONDAY, JUNE 12

GENERAL ASSEMBLY ROOMS A AND B

9:00 A.M.
Presiding—Lucile Harris, M.T. (ASCP)
Vondell Knight, M.T. (ASCP), Alternate
National Anthem—Frieda Claussen, M.T. (ASCP)
Betty Evans, M.T. (ASCP)
Invocation—The Rev. William Foster, Jr.,
First Presbyterian Church, Houston, Texas
Welcome—The Honorable Oscar F. Holcombe,
Mayor of Houston
Greetings—Ida L. Reilly, M.T. (ASCP), President
American Society of Medical Technologists.

9:30 A.M. "Report on the Board of Registry of Medical Technologists," Lall G. Montgomery, M.D., Chairman, Registry of Medical Technologists, Muncie, Indiana.

10:15 A.M. "The Role of a Laboratory in the Diagnosis of Fungus Diseases"—Emma S. Moss, M.D., Director of Dept. of Pathology, Charity Hospital, New Orleans, La.

11:00 A.M. "Photometric Measurements and Clinical Biochemistry"—G. R. Kingsley, A.B., M.S., Biochemist, General Medical and Surgical Hospital, Veteran's Administration Center, Los Angeles, California.

11:30 A.M. "Measurement of Total Base in Serum and its Diagnostic Significance"—F. William Sunderman, M.D., Chief of Clinical Pathology, Communicable Disease Center, Atlanta, Ga., President-elect, Am. Society of Clinical Pathologists.

12:00 Noon Formal Opening of Technical and Scientific Exhibits. Exhibits Open for Inspection Noon to 5:30 P.M.

Monday P.M.—See Entertainment Program

TUESDAY, JUNE 13

Exhibits Open 8:30 A.M. to 5:30 P.M.

Section One. ASSEMBLY ROOM A

8:30 A.M. Presiding—Phyllis Shaw, M.T. (ASCP)
Hortense Leach, M.T. (ASCP), Alternate
"A Study of Aspiration of Bone Marrow"—Jane Maghan, M.T. (ASCP), Duluth, Minn.

9:00 A.M. "SEPA—A New Anti-Coagulant"—Sister M. Antonia, M.T. (ASCP), St. Joseph Infirmary, Louisville, Kentucky.

9:30 A.M. "Tissue Culture Technique—Its Potentials in Clinical Laboratory Work"—Charles M. Pomerat, M.D., Professor of Cytology, University of Texas Medical Branch, Galveston, Texas.

10:00 A.M. VISIT EXHIBITS

11:00 A.M. "Laboratory Tests in Suspected Viral Diseases"—J. V. Irons, Sc.D., Director of Laboratories, Texas State Dept. of Health, Austin, Texas.

11:30 A.M. "The Effect of Endocrines on the Hematopoietic System"—Robert Hettig, M.D., Baylor University College of Medicine, Houston, Texas.

12:00 Noon Noon Recess

Section Two. ASSEMBLY ROOM B

8:30 A.M. Presiding—Barbara Isbell, M.T. (ASCP)
Elsie Urbantke, M.T. (ASCP), Alternate
"Medical Technology in Research"—Nila Maze, M.T. (ASCP), Indianapolis, Ind.

9:00 A.M. "Comparative Study of the Spinal Fluid and Blood Findings in Poliomyelitis and St. Louis Encephalitis"—Sister M. Dolorosa, M.T. (ASCP), Firmin Desloge Hospital, St. Louis, Mo.

9:30 A.M. "Modern Methods for Making Fecal Examinations for Helminthic Infections"—Asa C. Chandler, Ph.D., Rice Institute, Houston, Texas.

10:00 A.M. VISIT EXHIBITS

11:00 A.M. "Some Experience in the Production and Use of Viral Encephalitides Complement-Fixing Antigens (Mouse Brain Origin)—Thelma Sullivan, M.T. (ASCP), Texas State Dept of Health, Austin, Texas.

11:30 A.M. "The Laboratory Diagnosis of Amoebiasis"—Elberton J Tiffany, M.D., Senior Surgeon in Charge Consultation Services, USPHS, Atlanta, Georgia.

12:00 Noon Noon Recess

TUESDAY, JUNE 13, P.M.

Section One. ASSEMBLY ROOM A

2:00 P.M. Presiding—Sadie Cartwright, M.T. (ASCP)
Florence Strang, M.T. (ASCP), Alternate
"The Value of an Insulin Tolerance Test in the Diagnosis of Functional Hypoglycemia" — Sister Mary James, M.T. (ASCP), Santa Rosa Hospital, San Antonio, Texas.

2:30 P.M. "The Application of Radioactive Isotopes to Biology and Medicine"—J. H. Gast, Ph.D., Baylor University College of Medicine, Houston, Texas.

3:00 P.M. "The Laboratory Diagnosis of Brucellosis"—Elberton J. Tiffany, M.D., Senior Surgeon in Charge Consultation Services, USPHS, Atlanta, Georgia.

3:30 P.M. Visit Exhibits
4:00 P.M. See Entertainment Program.

Section Two. ASSEMBLY ROOM B

2:00 P.M. Presiding—Ellen Skirmont, M.T. (ASCP).
Ruth Guy, M.T. (ASCP), Alternate.
"The Value of Photomicrography in Color in the Study of Hematology"—Sister Mary Leo Rita, M.T. (ASCP), St. Louis, Mo.

2:30 P.M. "Comparison of Diagnostic Culture Media in Tuberculosis"—Martha Wilkerson, B.A., M.A., Baylor University College of Medicine, Houston, Texas.

3:00 P.M. "Recent Advances in Cancer Research"—William O. Russell, M.D., M. D. Anderson Hospital, Houston, Texas.

3:30 P.M. Visit Exhibits.

4:00 P.M. See Entertainment Program.

WEDNESDAY, JUNE 14
Exhibits Open 8:30 A.M. To 5:30 P.M.

9:00 A.M. House of Delegates Meeting—Assembly Room A
Motion Picture Films—Assembly Room B
Speaker's Supplies Committee Responsible:
Selections made by John N. Frazier, M.T. (ASCP).

THURSDAY, JUNE 15
Exhibits Open 8:30 A.M. To Noon

Section One. ASSEMBLY ROOM A

8:30 A.M. Presiding—Margaret Haraway, M.T. (ASCP).
John N. Frazier, M.T. (ASCP), Alternate.
Symposium: Argonne National Laboratory, University of Chicago, Chicago, Illinois.
"Recent Trends in Bleeding and Clotting Times of Whole Blood"—Margaret Sanderson, M.T. (ASCP).
"Phenylhydrazine Stimulation of Erythropoiesis in Refractory Anemia"—Charlotte Rowitt, Dept. of Medicine, University of Chicago.
"Hematologic Effects of Radio-Phosphorus in the Rat"—Ellen Skirmont, M.T. (ASCP).
"The Role of the Spleen in Radiation Injury and Recovery"—Edna K. Marks, M.T. (ASCP).
"The Effect of Spleen Protection on Iron Turnover in Irradiated Rats"—Melba Robson, M.T. (ASCP).
Papers will be discussed by Leon O. Jacobson, M.D., Associate Professor of Medicine and Associate Dean of Biological Science Division, University of Chicago, Albert Merritt Billings Hospital and Consultant to the Biology Division of the Argonne National Laboratory.

9:40 A.M. "The Impedance Angle and Thyroid Dysfunction"—Margaret Krepsky, M.T. (ASCP), Wauwatosa, Wisconsin.

10:00 A.M. Visit Exhibits.

10:30 A.M. "Advances in the Detection of RH Antibodies"—Ruth Guy, B.A., M.S., M.T. (ASCP), Baylor Hospital, Dallas, Texas.

11:00 A.M. "Hemopoietic Effects Mediated through the Adrenal"—Charles L. Spurr, M.D., Chief of Research Lab, V. A. Hospital, Associate Professor of Medicine, Baylor University School of Medicine, Houston, Texas.

11:30 A.M. "A Suggested Method for the Detection of the Diabetic and Pre-Diabetic"—Doris M. Wallace, M.T. (ASCP), Houston, Texas.

12:00 Noon Noon Recess.

Section Two. ASSEMBLY ROOM B.

8:30 A.M. Presiding—Virginia Wier, M.T. (ASCP).
Dorothy Patras, M.T. (ASCP), Alternate.
"Metabolism of Sodium in Health and Disease with a Photelometric Method for its Determination in Biological Fluids"—Sister M. Simeonette, M.T. (ASCP), Nazareth College, Louisville, Ky.

9:00 A.M. "Colorimetry—A Brief Discussion of Principles and Techniques"—Frances Jones, B.A., M.S., M.T. (ASCP), Baylor Hospital, Dallas, Texas.

9:30 A.M. "A Technologist Viewpoint of the Community and Walking Blood Banks"—Lona Jacobson, M.T. (ASCP), Danville, Ill.

10:00 A.M. Visit Exhibits.

10:30 A.M. "Cultural Differentiation of Bacteria by Means of Impregnated, Dry Paper Pads"—Mary J. Nix, M.T. (ASCP), Portland, Oregon.

11:00 A.M. "Trichomycosis Axillaris"—Report of Three Cases of Trichomycosis (Flava), Due to Nocardia Tenuis—Elizabeth K. O'Toole, M.T. (ASCP), University of Colorado Medical Center, Denver, Colorado.

11:20 A.M. "A Rapid Qualitative Turbidity Method for Determining the Relative Sensitivity of the Urinary Organisms to the Various Sulfonamides and Antibiotics"—Mary C. Gibb ,M.T. (ASCP) Lincoln, Nebraska.

11:40 A.M. "The Medical Technologist Looks at Tuberculosis"—Anne B. Maddocks, M.T. (ASCP), Benjamin Franklin Hospital, Columbus, Ohio.

12:00 Noon Noon Recess.

THURSDAY, JUNE 15, P.M.

Section One.
2:00-3:00 P.M.

CASTILIAN ROOM

Presiding—Betty Evans, M.T. (ASCP).
Meeting of State Treasurers or Their Representatives—
Rose Matthaei, M.T. (ASCP), Chairman
Mary Eichman, M.T. (ASCP).

MING ROOM

Presiding—Betty Jean Randal, M.T. (ASCP).
Serology Technique—Phyllis Shaw, M.T. (ASCP), Chairman.
Dorothy Patras, M.T. (ASCP).

ASSEMBLY ROOM A

Presiding—Mary Gibb, M.T. (ASCP).
Problems of Education of Medical Technologists—John J. Andujar M.D. Chairman.
Rachael Lehman, M.T. (ASCP).
Sister Jean Claire, M.T. (ASCP).
Evelyn Jardine, M.T. (ASCP).

ASSEMBLY ROOM B

Presiding—Frances Moore, M.T. (ASCP).
"Round-Up Time"—Lucille Wallace, M.T. (ASCP), Chm.
Ina Maxson, M.T. (ASCP).
Lois Hensley, M.T. (ASCP).
Winogene McIntyre, M.T. (ASCP).
Sister Charles Miriam, M.T. (ASCP).
Assisted by the State Membership Chairmen.

NORMANDY ROOM

Presiding—Virginia Woodhead, M.T. (ASCP).
Recruitment—Dorothy Foreman, M.T. (ASCP), Chairman.
Hortense Leach, M.T. (ASCP).
Ruth Feucht, M.T. (ASCP).

Section Two.

3:30-4:30 P.M.

CASTILIAN ROOM

Presiding—Betty Evans, M.T. (ASCP).
Facts About Compulsory Health Insurance — George A. Schenewerk, M.D., Dallas, Texas.

MING ROOM

Presiding—Betty Jean Randal, M.T. (ASCP).
Serology Technique—Phyllis Shaw, M.T. (ASCP), Chairman
Dorothy Patras, M.T. (ASCP).

ASSEMBLY ROOM A

Presiding—Mary Gibb, M.T. (ASCP).
State Licensure—Lall G. Montgomery, M.D., Chairman
Vernal Johnson, M.T. (ASCP).

ASSEMBLY ROOM B

Presiding—Frances Moore, M.T. (ASCP).
Publicity—Frieda Claussen, M.T. (ASCP), Chairman.
L. B. Soucy, M.T. (ASCP).
Members of the Public Relations Committee.

NORMANDY ROOM

Presiding—Virginia Woodhead, M.T. (ASCP).
Government and American Medicine—F. J. L. Blasingame, M.D., Wharton, Texas.

ENTERTAINMENT PROGRAM

SUNDAY, JUNE 11, 1950

1:30 - 3:30 P.M. Sightseeing tour of Houston—University of Houston—Sponsor.
6:00 - 8:00 P.M. Reception: Grecian Room, Hotel Shamrock—Texas Society of Medical Technologists—Host.

MONDAY, JUNE 12, 1950

2:00 P.M. Sightseeing tour of Houston for Sisters—University of Houston—Sponsor.
2:00 P.M. Trip to San Jacinto Battlegrounds, Monument, Battleship Texas, Dinner at San Jacinto Inn.

TUESDAY, JUNE 13, 1950

4:00 P.M. "Bit o' Texas"—Entertainment, Barbecue Supper, Campfire and Songs of the West.

WEDNESDAY, JUNE 14, 1950

2:00 P.M. Sightseeing Tour of Houston for those not attending House of Delegates Meeting—University of Houston—Sponsor.

THURSDAY, JUNE 15, 1950

8:00 P.M. Annual Banquet: Awards—Dancing Afterwards.

A. S. ALOE COMPANY
St. Louis, Mo.
Display of our unitized Moduline stainless steel furniture—the Bryan-Garrey Pipette Roter—the new Coleman Model 6a Spectrophotometer with technical manual and calibration service—improved Hemoglobin testing equipment—new sets for repid determination of blood sugar, etc., and various other standard and specialty apparatus of interest to clinical medicine.

AMES, COMPANY, INC.
Elkhart, Ind.
Ames Company representatives will be glad to discuss and demonstrate Clinitest, Bumintest, Acetest, and Hematest, simplified tests for the detection of urine-sugar, albumin, acetone bodies, and occult blood.

DIFCO LABORATORIES, INC.
Detroit, Mich.
The Difco exhibit for the Medical Technologists will consist of a display of standardized culture media for all microbiological procedures. This will include media for the detection and primary isolation of pathogenic microorganisms, together with differential media most commonly employed for culturing organisms associated with blood and respiratory and enteric infections, as well as fungous diseases.
Other reagents for clinical leboratory procedures will include Bacto-Penase for the inactivation of penicillin, antigens for the sero-diagnosis of syphilis, Bacto-Thromboplastin, Bacto-Cephalin Cholesterol Antigen, Bacto-Thymol Turbidity Reagent, and Phenolsulfonphthalein.

FISHER SCIENTIFIC COMPANY
Pittsburgh, Pa.
At the Fisher Scientific booth there will be exhibited the new improved Kahn Shaking Machine and Kahn Viewer, the versatile Fisher Electrophotometer and the new improved style Spencer Microscope Illuminator. There also will be displayed other new Fisher items of use to the medical technologists.

KIMBLE GLASS
Toledo, Ohio
Kimble Glass, division of Owens-Illinois Glass Company, will exhibit a representative line of Kimble laboratory glassware, including volumetric and calibrated apparatus. Products bearing the well-known trademarks EXAX, NORMAX, and "K" brand will be included as well as the Kimble Blue Ring Yellow Back thermometer.

LEDERLE LABORATORIES DIVISION
AMERICAN CYANAMID COMPANY
New York, N. Y.
Aureomycin Hydrochloride Lederle is a yellow, crystalline antibiotic obtained from the mold Streptomyces aureofaciens. It is one of the most versatile antibiotic drugs yet discovered. It is potent against a wide range of Gramnegative organisms, and is highly specific against rickettsail infections. It is also effective against most cases of primary atypical pneumonia, an infection of unknown ediology, frequently presumed to be caused by a virus.

THE C. V. MOSBY COMPANY
St. Louis, Mo.
The C. V. Mosby Company takes pleasure in displaying its publications at this year's meeting of the American Society of Medical Technologists. A representative selection of titles will be shown and a cordial invitation is extended to visit the Mosby Booth and examine at leisure any of our books that may be of interest.

ORTHO PHARMACEUTICAL CORPORATION
Raritan, N. J.
Ortho cordially invites you to Booth No. 42 where the complete line of Ortho diagnostic reagents will be on display. Featured will be the Ortho line of Blood Typing Sera including Anti-Rh, Anti-Hr, Blood Grouping, and Anti-Human Serum for the Coombs Test.

WILLIAM BUCHANAN BLOOD CENTER
Dallas, Texas
Comparison of the various methods of Rh Testing. This exhibit is designed as a demonstration of the different techniques used in the detection of Rh antigens and antibodies.

CENTRAL SCIENTIFIC COMPANY
Chicago, Illinois
The Cenco exhibit features new apparatus for laboratories including the Cenco Stainless Steel Serology Bath, Microslide Dispenser, Thermostatic Electric Hot Plate, Plastic Agglutination Plate, Aneroid Barometer, Hygrometer, Culture Tubes with deep form plastic caps, the Cenco Bakelite Test Tube Support and other Clinical items.

W. H. CURTIN & COMPANY
Houston, Texas
W. H. Curtin & Company will display numerous new scientific instruments and apparatus of advanced design. Included are the following: Bicknell Manometric Van Slyke Blood Gas Apparatus; Eberbach Shakers for Kline and Kahn Tests; Bausch & Lomb and Spencer Phase Contrast Accessories; Berkeley Microtome Knife Sharpener; "Precision" Paraffin Tissue Section Water Bath; B-D Vacutainer and Vacutainer Culture Bottle; H.S.R. Synthetic Resin Mounting Medium.

HOSPITAL LIQUIDS, INC.
Chicago, Illinois
Hospital Liquids, Inc., will display its new blood collection bottle with built-in final filter eliminating the need for any additional blood filter. Also shown will be our line of Sera for blood typing and our Shaw intravenous solutions. Make it a must to visit Booth 16.

AMERICAN HOSPITAL SUPPLY CORPORATION
Evanston, Illinois
We will display and demonstrate Baxter transfusion equipment together with the sterile expendable accessories; our complete line of human blood typing serums; a selected group of reagents and standards; the Seldon-Rogers Blood Shaker and the new Krasno-Ivy Flicker Photometer. In addition to this we will have some of our Tomac specialties.

TEXAS HOSPITAL & SURGICAL SUPPLY CO.
Dallas, Texas

BOOKS—PUBLICATIONS
W. B. Saunders Co.; University of Chicago Press; Chas. C. Thomas Co.; Williams & Wilkins.

SEROLOGY WORKSHOP

Plans for the Serology Workshop have been completed. The interest of the Author-serologists has been most gratifying. Each Author-serologist selected a representative who had worked with him in his laboratory. The information and technique demonstrated will thus be "first hand." The tests and the representatives who will demonstrate them are as follows: Kline test, Mrs. Hazel Suessenguth, Cleveland, Ohio; Mazzini test, Miss Virginia Darroch, Jacksonville, Florida; Kolmer complement fixation, Mr. K. C. Knolle, Austin, Texas; Hinton test, Miss Betty McGrew, Austin, Texas; Kahn test, Mrs. Dora Jenkins, Houston, Texas; V.D.R.L. test, Mrs. Dorothy Kelly, Fourth Army Area Laboratory, Fort Sam Houston, San Antonio, Texas. We hope that each individual member attending the workshop will benefit, and that the project will help in standardizing serological technique.

SCIENTIFIC EXHIBITS FOR THE 1950 A.S.M.T. CONVENTION

What Massachusetts has been doing 1949-1950 and come to your national convention in Massachusetts in 1951.
American Society of X-Ray Technicians.
American Registry of X-Ray Technicians.
The Registry of Medical Technologists of the American Society of Clinical Pathologists.
Vocational guidance.
Alpha Delta Theta, the National Medical Technology Sorority.
Plating of cells and tissues under vacuum.
Proposed classification of blood cells.
Bone marrow studies.
Cleveland Society exhibit.
Virus laboratory demonstrations from the Texas State Health Department Laboratory, Dr. J. V. Irons, Sc.D.
The Hargraves Method for the diagnosis of disseminated Lupus Erythematosus: Submitted by the Staff of the Clinical Pathology Laboratory of the Buffalo General Hospital, Buffalo, New York (Stuart L. Vaughan, M.D., Director).
Studies of the Function of the Mammalian Spleen: Submitted by Dr. Leon O. Jacobson, of the Argonne National Laboratory and the Dept. of Medicine, University of Chicago.
Drug Assays with Tissue Culture Methods: Submitted by Dr. C. M. Pomerat, Professor of Cytology, University of Texas School of Medicine.

MORE CONVENTION ANNOUNCEMENTS

The Registrations and Credentials Desk will open at 8:00 A.M. Sunday, June 11. Be sure to get your Kit at the Information Desk. The hostesses there will be able to direct you to the Church of your choice. EXTRA! The University of Houston will sponsor tours of the city of Houston. Buses will leave the Shamrock promptly at 1:30 and 3:30 p.m. Sunday at 2:00 p.m. Monday (for the Sisters, only) and at 2:00 p.m. Wednesday for those who aren't attending the House of Delegates meeting.

Advisory Council Meeting at 1:30 P.M. Sunday.

From 6:00 to 8:00 P.M. Sunday, the Texas Society of Medical Technologists will be host to the convention group in the Grecian Room. There we shall meet new friends and greet old ones. (Informal dress.)

Monday, June 12, at 2:00 P.M. buses will leave the Shamrock for the San Jacinto Battle Ground, visit the Battleship Texas, San Jacinto Monument, and a Seafood and Fried Chicken Dinner at the Inn. Transportation, tours, dinner and all will cost $5.30. (Sport clothes and comfortable shoes.)

Tuesday, June 13, at 4:30 P.M., buses will leave the Shamrock for the Marks Ranch, a "Bit o' Texas," Barbecue dinner, Campfire and Cowboy songs and stories, all for $3.75. Go Western—blue jeans and boots, or slacks, or sport clothes will do.

You'll be sorry if you don't plan to take a swim in the Shamrock pool!

Thursday evening, June 15, the high spot of the convention, Banquet in the Emerald Room at the Shamrock at 8:00 P.M. Convention Awards. All the V.I.P. will be there. Dancing afterwards. (Formal, but you'll be just as welcome if you'd rather not.) For $7.50.

If you send a check in advance, please don't ask for a refund after June 1. (We'd rather you don't send any money.)

HOTEL RESERVATIONS for June 12 through June 15, 1950

At the Hotel Shamrock, Houston, Texas. Make your reservations direct with the hotel.

Rates: Single: $6-$16.

2. Double: or Twin Beds: $8-$18. Single or Double Occupancy.
3. Suite: Room with Boudoir: $10-$20. Single or Double Occupancy.
4. Suite: Parlor and Bedroom: $18-$30. Single or Double Occupancy.
5. Suite: 3 and 4 Room with Boudoir. $30-$40. Single or Double Occupancy. Add $3 for each additional person in 2, 3, 4 or 5.

If a sufficient number of Sisters wish hotel accommodations, a separate block of rooms will be reserved for them. For Sisters' reservations, write to Sister M. Aniceta, St. Joseph's Infirmary, Houston 3, Texas.

If, after your reservation has been made, you find that you will be unable to attend the convention, please be sure to cancel your reservation directly with the hotel.

For reservations outside the hotel, write Miss Shige Nagai, 6608 Plaza Drive, Houston 4, Texas.

SEEING THROUGH THE EYES OF TEXAS

By J. Frances Martyn

Don't you wish that you could come to Texas now to see the bluebonnets? There are fields of them in bloom. All of the many pictures painted of them don't begin to do justice to their beauty. They won't be blooming in June but I thought I'd tell you about them now so you would want to come to Texas.

All of our "Texas brags" aren't exaggerations. We really do have lots of things to be proud of, and who are we to keep quiet? For instance, did you know that whatever climate you want can be found in Texas—seashore, mountains, plains, desert, or rolling hill country. You can have a big city, a dude ranch, a fishing resort, or a plain sight-seeing vacation while you are here.

Fort Worth is the city where the West begins. (By the same reasoning, does this mean that Dallas is the spot where civilization disappears?) Cow Town is noted for its rodeo and also the huge Boeing Bomber plant, largest in the world, located there. Thirty miles eastward is found the site of the state fair, the most fabulous stores you can imagine, and a terrific amount of civic pride. That's Dallas and it's not in the least overrated.

Historical Texas is found in San Antonio. The Alamo and Guadalupe Missions are found here. The Alamo was the site of one of the last battles of the Texas Revolution. Every defender was killed by General Santa Anna's army, but their memory was carried on in the Battle cry at San Jacinto—"Remember the Alamo." At the Mission Guadalupe there is the lovely Rose Window carved in memory of a sweetheart who died on the day of their wedding by one of San Tone's first settlers.

Houston is the largest city in the state. It is growing so fast that even the residents have a hard time knowing what's in the city. The Houston Ship Channel and turning basin are responsible for the fact that this is the largest inland port in the nation. I mentioned San Jacinto up above. Here's where the final battle of the Revolution was fought. It is now a state park with a large monument and the war-weary Battleship TEXAS located within it. Houston has many city parks and lots of golf courses, so be sure to bring your golf clubs and please don't forget your swim suits because the gulf is only one hour's drive away and you'll want to swim there. Right across from the Shamrock where you'll stay is the site of the new Texas Medical Center. There are three hospitals already built and one under construction, the Professional Building, and the Baylor Medical School. You will be welcomed on a tour of any of these places.

There are so many places I wish I could tell you about—Galveston, Kerrville, the Valley, Laredo, and lots more. But this is already late for the Journal deadline so why don't you just come see for yourself. See you in June.

IN CASE YOU'RE INTERESTED

At the meeting of the Board of Directors on June 24, 1949, in Roanoke, Virginia, we were instructed that:

"An article should be published in the A.J.M.T. explaining the duties of the new (Executive) office and the change of management. It should be made clear that the new office is a combination into one office of the Executive Secretary, the Business Manager and Editor of the A.J.M.T., and that there is a possibility that the business of procuring advertising for the A.J.M.T. may have to be let to an agent; it should be clear that applications for that agency should be sent in immediately by interested persons."

During the first six months that the Executive Office has been in Houston, we have tried to give the membership the kind of service they should expect from a sincere desire to see our national Society grow to the proportions of one which may be truly recognized as representative of the profession of Medical Technology. This has not been easy. It has meant long weeks and long hours. But we feel that when you come to the national convention in Houston, next June, you will find in YOUR office at 6544 Fannin St., a place where you can be assured that your problems will be considered carefully and answered promptly, or referred to someone who can assist you to the best solution possible. We hope that when we have the office even better organized—this is something that cannot be accomplished immediately—that the administrative affairs of the A.S.M.T. will be taken care of efficiently and with dispatch.

The Board of Directors has been most understanding in the realization that we must have equipment and personnel to render the type of service our membership deserves. In June we shall show you an office of which you will be proud to say "This is **our** Executive Office." Thus far we have been most concerned with the membership—processing of dues collecting and recognition of new members. We have had a keen interest in keeping our old members as well as accepting new ones. We feel that an organization that cannot hold its membership is not strong. Therefore, we recognize that our old members are as important to the society as acquiring large numbers of new ones. We welcome these new members and hope that they will continue in our fellowship for many years.

The cooperation of the state treasurers has been most gratifying. A bi-monthly Newsletter to the national and state Boards of Directors has been an innovation of this year. Much of the information contained therein has been directed to the state treasurers, due, primarily, to the fact that so much of the business of the Executive Office is concerned with the collection and processing of dues. We are wondering if it might not be feasible to have a bi-monthly Newsletter for the whole membership.

Another concern of the office has been in keeping up with the registered Medical Technologists—we are trying to keep our Master List of registrants up to date. The Registry Office has been of inestimable assistance to us in this, and in other ways. We are hoping that we shall find it possible in a very short time, to supply each state society with an up-to-date list of their registered Medical Technologists (ASCP), and if there will be someone in those organizations who will take the responsibility, we shall be able to keep them supplied with current corrections. We are hoping also, as time goes by, so to study those lists that we may assist the Membership Committees to get in touch with every potential member of A.S.M.T., and to eliminate much of the writing to those persons who are not actively engaged in the practice of medical technology, but who wish to keep up their certification.

Another hope is that we may assist in the compilation of material for distribution to potential medical technologists and to vocational guidance counsellors. A.S.M.T. needs such material. To date our only information for such distribution has been that of the Registry which can result in duplication of effort, and possible waste.

We are making every effort to keep up with the addresses of our members and to keep them receiving their journals regularly. Since the office has been located in Houston, we have been making our own addressograph plates. Thus far we have made over 2000—a figure approximating nearly 50% of our total membership. We find that many of the members neglect to notify us of address changes promptly. This results in delay—and possible loss—of current issues of the journal. Every member is entitled to six issues of the AMERICAN JOURNAL OF MEDICAL TECHNOLOGY each year. We cannot know if you do not receive your copies unless you notify us, and keep us posted as to your current addresses.

With the combination into one office of the Executive Secretary, Business Management and Editorship of the journal, we feel that having these various duties under one roof, we can better keep in touch with all phases of the administrative work of our society. There is still much to be done, but with the fortunate circumstance of excellent secretarial and stenographic assistance in the office, we hope that by June 1950, we shall show YOU, our members, an efficiently functioning office, an office you'll be assured will render you and OUR profession, such service as will bring Medical Technology to its rightful station in the Medical World.

R. M.

ABSTRACTS

METHODS OF ISOLATION AND INCIDENCE OF BRUCELLA TYPES FOUND IN GEORGIA by Alice Brim, M.S., Janie F. Morris, M. S., and E. J. Sunkes, M.S., D.P.H. Atlanta, Ga., from the Georgia Department of Public Health Laboratories. Jour. Lab. & Clin. Med. 35: 483 (March) 50.

These authors state that "though numerous attempts were made, no isolations were obtained from specimens which showed negative agglutination tests, or which showed slight agglutination in low dilutions."

Since the technic used is given in detail, the abstract author is including it for the perusal of its readers.

METHODS AND MATERIALS

The Agglutination Test:—Whole clotted blood usually is received for the various tests, including blood cultures, agglutination series, and other serologic tests. The information forms accompanying the specimens are studied carefully for the physician's requests, his findings and tentative diagnosis. Serum for demonstrating brucella agglutinins is removed aseptically, leaving the clot uncontaminated.

The macroscopic tube agglutination test is performed using a **Brucella abortus** antigen prepared from **Br. abortus No. 456.** The culture, which was obtained from the National Institute of Health, is checked for smoothness each time the antigen is prepared. Forth-eight hour growth of the organisms on tryptose agar[3] is harvested in 0.5 per cent phenolized saline solution, heated at 60 to 65° C. for thirty minutes, and checked for sterility. The antigen is then centrifuged, washed with fresh saline, and diluted to correspond with barium sulfate standard No. 2. Each lot of antigen is tested with serums of high, low and negative titers.

The patient's serum is diluted in 0.5 ml. amounts with 0.85 per cent sodium chloride using the two-fold progression beginning with a 1:20 dilution through 1:640. Five-tenths milliliters of antigen is added to each tube. The tests are incubated four to six hours in a 45° C. water bath and refrigerated over night before reading. Though this laboratory is aware of the problem in reporting certain findings in the agglutination test as "positive" or being of "diagnostic titer," a test showing moderate to complete agglutination in the dilution of 1:320 or higher is considered "positive." Slight to moderate agglutination in dilutions lower than 1:320 is considered "doubtful" and a second specimen is requested to demonstrate a rise in titer.

Blood Clot Cultures:—The blood clots are cultured for brucella under any one of the following conditions:

(1) If requested by the physician.

(2) If a "positive" or "doubtful" agglutination reaction as already described is obtained.

(3) If the clinical evidence presented by the physician strongly indicates brucellosis although agglutinins are not demonstrated.

Prior to June, 1947, all cultures for brucella were incubated at 37° C. in candle jars, Since then they have been grown in a special CO_2 incubator devised in the Atlanta laboratory in the Georgia Department of Public Health. The incubator maintains an average atmosphere of approximately 10 per cent CO_2 and has proved satisfactory for growing brucella as well as other bacteria.

Since July, 1948, we have used a culture bottle described by Casteneda containing both the broth for enriching the bacteria and the agar for the subculture. About 15 ml. of tryptose agar are sterilized in a 4-ounce drug bottle closed with a gauze covered cotton plug. While the agar is still liquid, the bottle is laid flat side down to allow the solidification of the agar on the broad wall. Sterile tryptose broth is added and the bottle incubated for sterility before using.

After the clot is mashed through the syringe into the bottle it is incubated in the upright position in the CO_2 incubator. Twice weekly the bot-

tles are tilted carefully so that the blood-broth mixture spreads over the agar, thus making the subculture. Incubation is continued for a month unless brucella organisms are isolated earlier. If contaminants are present, subcultures are made to crystal violet tryptose agar plates which are held one week before being finally examined.

When suspicious growth is obtained, a Gram stain is made and a slide agglutination test is done using **Br. abortus** antiserum. Further identification and typing is effected by planting the cultures on tryptose agar plates containing appropriate dilutions of thionin and basic fuchsin. In the case of atypical cultures, investigation of nitrate reduction and CO_2 requirements is made. Hydrogen sulfide production tests have not been particularly helpful.

Special Blood Culture Outfits:—When agglutinins are demonstrated as high as 1:320 dilution of the patient's serum, a special blood culture bottle is mailed to the physician. This outfit consists of a rubber-stoppered flint glass, vaccine bottle containing about 30 ml. of tryptose broth with sodium citrate and 10 per cent carbon dioxide. The bottle carries a label directing the physician to swab off the rubber stopper with iodine and to inoculate through the stopper 5 to 10 ml. of blood collected aseptically.

When the outfit is returned to the laboratory it is incubated and subcultured to tryptose agar at weekly intervals for four weeks. Subcultures are obtained by withdrawing through the stopper a drop of culture with a sterile hypodermic needle and syringe. Tryptose agar with or without crystal violet is used for planting, depending on the presence or absence of contaminants. Subsequent growth is examined and identified as previously described.

The authors report attempts at adapting the Castaneda method for the mailed outfits were not wholly successful.

THE DETERMINATION OF SENSITIVITY TO PENICILLIN AND STREPTOMYCIN OF ENTEROCOCCI AND STREPTOCOCCI OF THE VIRIDANS GROUP by E. Jawetz, M.D., and J. B. Gunnison, M.A., San Francisco, Calif., from the Division of Bacteriology, University of California Medical School, and supported in part by a grant from the Research Committe, University of California Medical School. Jour Labr Clin Med 35:488 (March) 1950.

These authors report that penicillin sensitivity tests were performed on seven strains of viridans streptococci, eighteen strains of enterococci, and three strains of **Str. sanguis,** using a tube dilution technique with frequent subcultures on solid media. With enterococci, viable organisms were found in broth containing high concentrations of penicillin after many days of incubation at 37° C. The absence of visible growth does not indicate bactericidal but merely bacteriostatic action of he antibiotic.

A zone phenomenon was frequently observed in sensitivity tests with enterococci. A certain penicillin concentration resulted in death of all organisms, whereas both higher and lower concentrations of the antibiotic permitted survival of enterococci for many days. No zone phenomenon was observed with the other streptococci.

The addition of streptomycin to penicillin resulted in synergistic action of the two antibiotics on enterococci. When combined relatively small amounts of both drugs had a bactericidal effect.

The authors discuss the possible relationships between the in vitro observations and clinical findings.

The technique used was as follows, verbatus quote.

"Streptococci of the Viridans Group: Seven strains isolated from cases of subacute bacterial endocarditis or the upper respiratory tract of patients.

Streptococcus sanguis: Three strains labeled s.b.e.21, s.b.e.90, and s.b.e.95 (kindly made available to us by Dr. E. Alture-Werber). These strains exhibited the characteristics outlined by the original investigators.

Enterococci: Eighteen strains (five of them kindly supplied by Dr. L. A. Rantz) isolated from the blood stream or the urinary tract of patients in

San Francisco. The enterococci were typical morphologically and culturally. All belonged to Lancefield Group D. They grew freely in broth containing 6.5 per cent sodium chloride or 0.1 per cent methylene blue. They multiplied at pH 9.6. None of the other streptococci tested has these characteristics.

Culture Methods: All stock cultures were kept in 10 per cent blood broth at 4° C. for the duration of the experiments. The bacteria were grown in, and the sensitivity tests were carried out in Proteose Peptone #3 (Difco) broth of the following composition:

Proteose Peptone #3	20	Gm.
Bacto-Dextrose	0.5	Gm.
Sodium chloride	5	Gm.
Disodium phosphate	5	Gm.
Water	1,000	ml.

Subcultures were made on agar plates having the same base. All cultures were incubated at 37° C.

Sensitivity Test: The sensitivity tests were set up in small, metal-capped culture tubes in a total volume of 2 milliliters. Commercial crystalline sodium penicillin G(60mg. = 100,000 units) and commercial streptomycin sulfate were dissolved in sterile physiologic salt solution. The desired final concentrations were prepared in broth. Fresh solutions were used in every test. The inoculum of bacteria was 0.1 ml. of an eighteen-hour broth culture containing 10^8 to 10^9 organisms per milliliter (i.e., groups or chains of streptococci).

The inoculated tubes were incubated at 37° C. for twenty eight days and were inspected daily for the development of turbidity. At regular intervals a standard loopful (0.005 ml.) of broth from each tube was streaked on a segment of an agar plate. These subcultures were incubated at 37° C. for three days, and the number of colonies per segment were counted and tabulated, as

C = Confluent growth on plate, turbidity in broth tube.
++++ = More than 100 colonies on plate, no turbidity in broth tube.
+++ = 50 to 100 colonies on plate, no turbidity in broth tube.
++ = 10 to 50 colonies on plate, no turbidity in broth tube.
+ = 1 to 10 colonies on plate, no turbidity in broth tube
— = No colonies on plate (i.e., negative subculture), no turbidity in broth tube.

A negative subculture was believed to indicate that the total number of viable bacteria in the broth tube was less than 200. When larger volumes of broth from such tubes were subcultured in liquid media, organisms could sometimes be recovered. At the end of twenty eight days, or occasionally earlier, 0.1 ml. of commercial penicillinase (Bacto-Penase) was added to all tubes which had remained clear up to that time, and the subsequent appearance of turbidity or of growth in subculture was observed. This amount of penicillinase is said to inactivate about 1,000 units of penicillin. Tubes showing no growth in the six days following the addition of penicillinase were considered sterile.

JOURNAL

A limited number of July, September, and November, 1949, issues of THE AMERICAN JOURNAL OF MEDICAL TECHNOLOGY are available at a combination cost of $1.50 for the three issues. Single numbers are $0.75 each. Please mail order and check promptly to THE AMERICAN JOURNAL OF MEDICAL TECHNOLOGY, 6544 Fannin St., Houston 5, Texas.

REPORT OF THE
PUBLIC RELATIONS COMMITTEE OF A.S.M.T.

December 1949 to June 1950

Probably the greatest satisfaction received from the efforts of the Public Relations Committee as a result of the "protest letters" sent out in September 1949, (see report of P. R. Committee of June 1949 to Dec. 1949), was a letter received by the Chairman on March 8th, 1950, from the Secretary of the Joint Board of Directors of the Six National Nursing Organizations. This letter reported that "through recommendation of its Joint Committee on Practical Nurses and Auxiliary Workers in Nursing Services, this Board had voted to support the use of the title 'licensed practical nurse,' instead of the title 'nursing technician,' 'nurse technician,' or 'technician nurse'."

The Public Relations Committee feels satisfied and pleased that the National Nursing Organizations have taken this attitude toward the A.S.M.T. protest, and feels rewarded for their efforts in carrying out their assignment in connection with the Resolution submitted in June 1949, by the Texas Delegation.

Other than the above, no single, outstanding Public Relations project has been attempted during this first year of the committee's existence.

A number of individual letters were written in an effort to help a few of the states with advice on specific problems, as well as several letters of comment to authors of Medical Technology articles; praise to Career Editor of Seventeen, for the splendid article "Labs and Lasses"; thanks to Mrs. Drummond for the part the Registry has played in furnishing facts for editors and preparing reprints for distribution; appreciation to Albert Deutsch, author of "Menace in the Medical Labs" (April Woman's Home Companion), for his interest in our problems and profession, with a note of concern as to whether the "scanning" Public will lose *all* confidence in *all* laboratory workers.

The entire year has been one of groundwork for this committee, by means of intensive reading and study. Your chairman has invested in a number of books and pamphlets on the subject of Public Relations, and has taken out a membership with the National Publicity Council for Health and Welfare Services, in the interests of the society. Through this membership we may receive advice on individual problems and a great deal of helpful information about publicity procedures in general.

The entire Committee is concentrating now, in coordinating the things we have learned, the facts we have accumulated, and the plans we hope to carry out next year, into a program for the Publicity Workshop to be presented at the convention in Houston. By this means we hope to convey to all A.S.M.T. members, through the delegates at the convention, ways and means of carrying on publicity work in their own states, through the planned help of this committee, on a national scale. We want to pass on to you, what we have learned about publicity methods in general, as well as to present some workable ideas for the future in connection with certain specific groups.

To explain further, at this time, would be to divulge our program plans. Let it suffice to say that we feel that we are in the process of laying a good foundation for "Bigger and Better" Publicity and Public Relations, for our organization and for our profession in years to come.

Respectfully submitted,
Frieda H. Claussen, M.T. (ASCP), Chairman
Mary Nix,
Lavina White,
Josephine Pyle,
Doris Boon.

FROM THE PRESIDENT

Dear A.S.M.T. Members:

One of our well-known insurance companies advertises "the future belongs to those who prepare for it." I wonder if we medical technologists might not well give thought to this phrase as it applies to our profession.

All of us have been impressed with the lack of understanding of our profession by members of the various medical professions as well as by the public. An effective public relations and educational program can correct this.

Such a program can do more. It can open the way toward the recruitment and selection of the best potential material for medical technology.

It is imperative that we maintain a vigilance toward the introduction of legislation—Federal and State—that may affect our profession. A wide-awake Legislation Committee in every state is essential.

What we contribute to our professional organization, individually and collectively, is preparing for our future. Medical technology is deserving of a position among the most highly respected professions.

Sincerely yours,
Ida L. Reilly, M.T. (ASCP)

ANNOUNCEMENTS

Hillkowitz Memorial Contest—1950

Margaret Krepsky, who submitted the paper, "The Impedance Angle and Thyroid Dysfunction," has been chosen winner of the Hillkowitz Memorial Contest of 1950. She resides at 2241 N. 62nd Street, Wauwatosa 13, Wisconsin.

Signed: Sister M. Antonia
St. Joseph Infirmary
Louisville, Kentucky.

ALPHA DELTA THETA

Alpha Delta Theta, national medical technology sorority, has installed its twelfth chapter, the Mu chapter at the University of Colorado. The installation ceremonies took place on February 18, just a few days more than five years since the sorority was first established. As medical technology courses in colleges and universities over the nation are being increased in number, so, too, the organized efforts of the medical technicians are being advanced. Three more colleges have shown an interest in becoming members of the sorority, and with their admission, we will be represented well throughout the United States. It is the sorority's earnest desire to further the interests of medical technologists and to further the work of the State and National Societies of Medical Technology.

Signed: Mrs. Alice L. Fox
SCOPE Editor,
Alpha Delta Theta
2905 W. Villard Ave.
Milwaukee 9, Wis.

ANNOUNCING

The annual conference of the American Physical Therapy Association is to be held at the Hotel Statler in Cleveland, Ohio, June 26-30, 1950.

We wish to extend a cordial invitation to any of your members who may be able to attend the conference.

Signed: Lois P. Ransom
Assistant Executive Secretary.

STATE SOCIETIES

The 15th annual convention of the COLORADO S.M.T. was held on May 13 and 14, at the Hotel Albany, Denver. Guest speakers included Dr. James B. McNaught, President of the A.S.C.P., and Dr. Richard Thompson, Professor of the Department of Bacteriology, University of Colorado Medical Center. The INDIANA S.M.T. held its annual meeting on May 11, at the Hotel Marott, Indianapolis. Dr. Roy R. Kracke, Dean of the University of Alabama, was the after dinner speaker. The IOWA S.M.T. annual spring meeting was held on May 24 and 25, at the State University of Iowa, Iowa City, with the School of Medicine holding a two day Refresher Course. Dr. Lall G. Montgomery, of the Board of Registry, was the speaker at the banquet on May 24. On April 22, the KANSAS S.M.T. met at the Allis Hotel, Wichita, with a program covering all phases of medical technology. The Board of Directors chose the winner of the contest for designing a seal to be used by the society. The MONTANA S.M.T. third annual session was held in Missoula on March 9, 10, 11, and 12, in conjunction with a Refresher Course sponsored by the Montana State Board of Health and the Montana Society of Pathologists. A total of 103 persons attended the sessions. Out of state guests were Mrs. Lucille Wallace, Minnesota, Mrs. Winogene MacIntyre and Sister Mary Faith, Washington. The OREGON S.M.T. held an annual convention in the Medical Dental Building Auditorium, Portland, on May 20. The annual convention of the NEBRASKA S.M.T. was held in April. Their placement service is having the usual problem of too many openings and too few technologists to fill them. The NORTH DAKOTA S.M.T. held a meeting on April 15. The SOUTH DAKOTA S.M.T. met in Yankton on March 25. The TEXAS S.M.T. held a meeting of the House of Delegates on April 30, in Austin, for the purpose of selecting delegates to the national convention. The rest of their convention will be held on June 11, in conjunction with the national meeting. The WEST VIRGINIA S.M.T. met in Parkersburg, on April 29 and 30, at the Chancellor Hotel. The LOUISIANA S.M.T. held a Seminar and annual convention April 17 through 19 in New Orleans.

We shall be glad to announce state conventions in an issue of the JOURNAL which will serve as an additional reminder to members residing in the respective states provided we receive the notices on time. See March A. J. M. T. for deadlines.

STATE SOCIETY OFFICERS

1950-51

ARKANSAS: President: Betty Rice, P. O. Box 2731, Little Rock.
President-elect: Mrs. Bennie R. Bargas, 3923 Oakwood, Little Rock.
Secretary: Virginia Vaught, Army-Navy Hospital, Hot Springs.
Treasurer: Henry C. Dyer, 211 Sunset Ave., Nashville.

MISSOURI: President: Mildred Oswald, 4552 Laclede, St. Louis.
President-elect: Ann J. Sommer, 3803 Utah Place, St. Louis.
Secretary: Mrs. Ruth Baker Branson, 232 E. Pacific St., Springfield.
Treasurer: Doris Clark, 1837 Pendleton, Kansas City.
Board Member: Lydia Palmeier, 6150 Oakland, St. Louis.

MONTANA: President: Mrs. Vera Hovde, 2205-4th Ave. No., Great Falls.
Vice-President: Berenice Bayliss, 725 So. Grand, Bozeman.
Secretary-Treasurer: Norma Arnston, Great Falls Clinic, Great Falls.
Board of Directors: Sr. Pascaline Marie, St. Joseph Hospital, Lewistown, and Sr. Joachim, Holy Rosary Hospital, Miles City.

OHIO: President: Charlotte Thumm, 3323 Denison Ave., Cleveland.
President-elect: Sara Hanna, 1439 East Third St., Salem.
Secretary: Mary L. Fitch, Mansfield General Hospital, Mansfield.
Treasurer: Bessie Keating, 55 West Hebble, Fairborn.
Executive Secretary: Mrs. Ruth Ulam Clark, Grant Hospital, Columbus.
Immediate Past President: Bertina Orsborn, Old Trail-er Court, Columbus.

SOUTH DAKOTA: President: Sr. M. Mauritia (Schuermann), Sacred Heart Hospital, Yankton.
Vice President: Arthur R. Lundquist, Box 96, Webster.
Secretary-Treasurer: Sophia Rados, State Sanatorium, Sanator.
Board of Directors: Linda Goosen, 1201 West 22nd St., Sioux Falls. Sr. M. Vincentia (Wazolek), St. John's Hospital, Huron.